the OIL AND GAS JOURNAL

SEPTEMBER 12, 1955

New designs are on drafting boards for equipment to handle

DEEP-WATER DRILLING

...Page 80

What Detergent Injection Did at Grover Water Flood • Page 115

PAY ZONE···of a Service Policy

HALLIBURTON
OIL WELL CEMENTING
COMPANY
DUNCAN, OKLAHOMA

Daybreak dims the brilliance of oil field lights . . . a distant rooster challenges the rumble of the rigs . . . and the morning mist rolls aside for a huge red and silver truck. Service companies, also, work a twenty-four hour tour. Service is the esprit de corps of a Halliburton camp. Halliburton long ago adopted the policy of service beyond the fee, service above all. And this policy has spread thoroughly to every one of Halliburton's 250 camps. Here, in the center of practically every oil patch, is the pay zone of Halliburton's service policy. And here, too, research is one of our most important services.

"PROGRESS IN SERVICE THROUGH RESEARCH"

PAGE 1 ONE . . . *a glance ahead*

Year-end budget money will boost exploratory drilling. Due for extensive probing is the Delaware basin, a big hopeful geological province in West Texas and Southeast New Mexico. Further tests of the deep Devonian are coming up in addition to medium-depth wells to be drilled to the Bone Springs.

Pipelines planning 2,000 megacycle microwave systems can look forward to a new system arrangement using tower-top reflectors instead of cable-fed dishes. The new system, much like that used at higher frequencies, has a ground-mounted dish feeding a shaped tower-top reflector. This reflector is designed from a new mathematical approach to cut down on losses normally suffered with flat reflectors.

Slim-hole completion techniques will interest more operators as slim-hole drilling activity increases. Currently most companies ream out the small hole to accommodate conventional completion strings when production is found. But a cheaper method being examined is to case the small hole with tubing. Production could be through the tubing if anticorrosion measures are taken or through "micro" tubing strings.

Several major oil companies are now planning to expand existing alkylation capacity or build new units, specifically for motor-fuel octanes. They may have to do so without the generous rapid writeoff which ODM has granted to new alkylation capacity. Indications are they will go ahead anyway, as alkylation looms important in boosting octanes in the 100-range.

Substantial improvements in reforming catalysts are being quietly tested in commercial operations. Better performance at high severity levels is reported but formal announcements are awaiting further commercial testing.

Refiners and their unions are not anticipating special difficulties in reaching new agreements to replace those expiring this fall. In the southern areas consideration is being given to the government's directives in carrying out nonsegregation principles in industrial employment.

The OIL AND GAS JOURNAL

SEPTEMBER 12, 1955 • VOLUME 54 • NUMBER 19

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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Vacuum Unit Steps Up Cat Feed Quality 104
By W. J. Burch

Major capacity increases at its Lake Charles, La., refinery prompted Cities Service Refining Co. to install a new, modern 26,750-bbl. per day vacuum unit. This was designed to operate as an intermediate step between the topping units and the existing propane deasphalting unit which was the first unit installed for production of cracking feed stock.

Low-Water-Loss, Low-Density Cement 107
By W. E. Bergman, J. R. Hurley and F. J. Shell

Phillips Petroleum Co. has developed a new and improved oil-well cement. Densities as low as 10.7 lb. per gal. may be obtained with commercially available materials. The cement also exhibits low water loss, which eliminates danger of a flash set.

Facies Studies . . . Important Tool in Oil Finding 111
By L. L. Sloss

How to define and classify sedimentary facies to make the characteristics of the source and the reservoir rocks themselves a useful tool in helping to find oil. Regional, semi-regional, district, and pool studies can be made. The Great Basin area is an example of an area for which regional facies analysis provides a basis for evaluation. The Julesburg basin can be used as typical for use in semiregional studies.

What Detergent Injection Did at Grover Water Flood 115
By H. N. Dunning, R. T. Johansen, C. J. Walker, J. P. Powell, and J. W. Watkins

One year of detergent testing in the Grover water flood of northeastern Oklahoma shows that: (1) effective formation permeability and skin factors improved in most of the wells tested, (2) zones of oil-productive sand previously impermeable to injection water apparently were penetrated by the detergent solution, and (3) some increases in oil production were observed, but little definite increase can be cited as result of detergent injection.

Stabilization of Separator Liquid 120
By Dr. John Campbell

Part 6 in a series covers processing of separator liquid by stabilization. This practice has become more common in the past 5 years due largely to wide use of low-temperature separation equipment. Three basic types of stabilizers now in use are: (1) conventional reflux type, (2) high-pressure, nonrefluxed "cold-feed" stabilizers, and (3) same as (2) but operated at lower pressure. Stabilizer design is discussed in detail in relation to operation and cost of units.

Drilling Time at Bradley Reduced 129
By Norman S. Morrisey

Larger engines and bigger and better pumps contributed directly to reduction in drilling time in deep Bradley field, Garvin County, Oklahoma. Phillips Petroleum Co. drilled its 1 Sturr in 107 days. Total depth was 13,362 ft. Well was completed in prolific Simpson sands. A high-viscosity mud is best here. Phillips uses an oil-emulsion mud.

Alaskan Pipeline Joins Nation's Defenses 130
By Paul Reed

The Army's Alaskan products line is a 625-mile, 8-in. line running from Haines to Fairbanks, Alaska. Two spreads laid the line—one in Alaska and the other in Canada (the line runs 270 miles in Canada before it reenters Alaska).

Fluidized Coke Tested in Rotary Kiln 137
By R. M. Conforth and E. R. Lee, Jr.

There has been much speculation as to possible uses of fluid coke such as produced by Carter Oil Co.'s Billings, Mont., unit (other fluid coke units are under construction). Two Kaiser engineers tell of full-scale tests with burning of fluid coke in firing of a rotary kiln.

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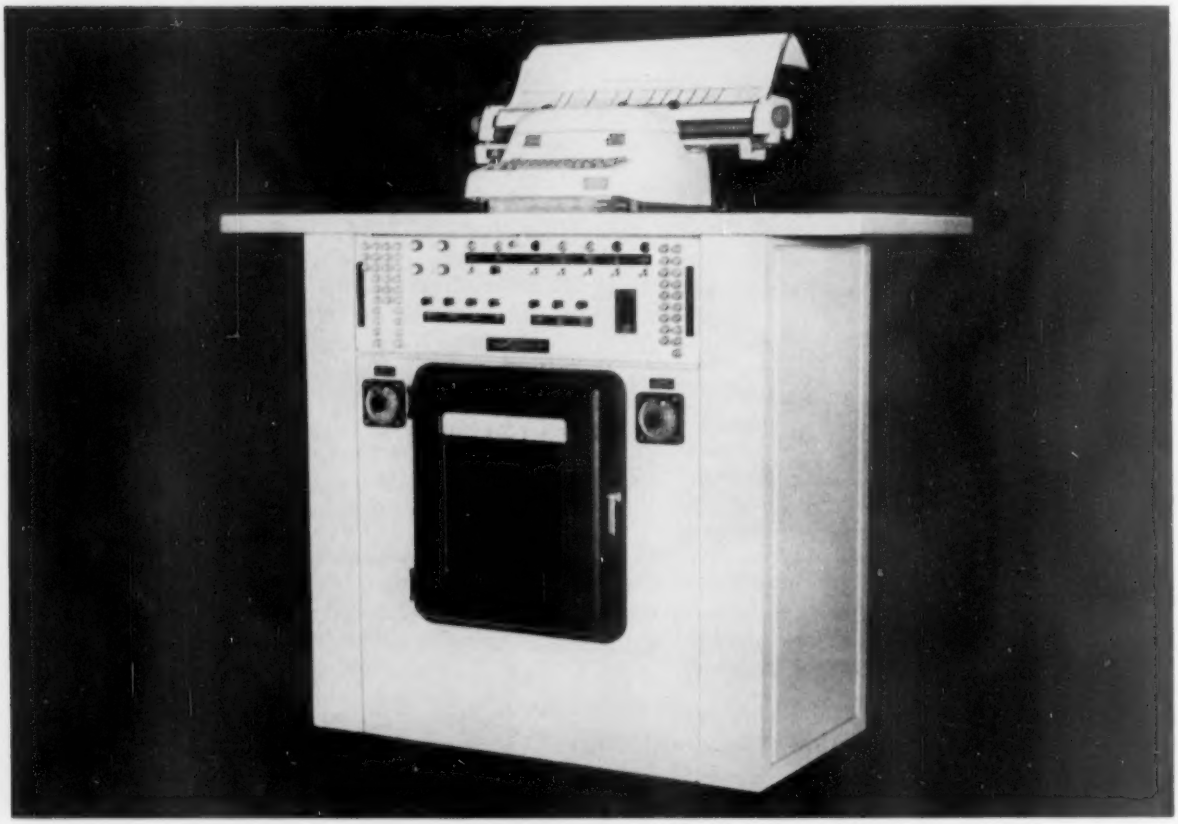

F&P Automatic Digital Readout

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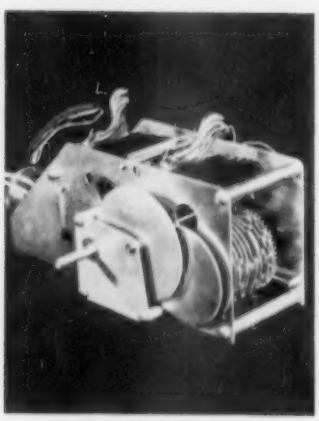

C-2 Digi-Coder Converter

This new addition to the F&P Automatic Logger line has been designed to eliminate the time delay and the human error involved in plotting compositions from the continuous strip-chart recorder of the spectrometer. The readout, quickly connected to most existing mass spectrometers, provides:

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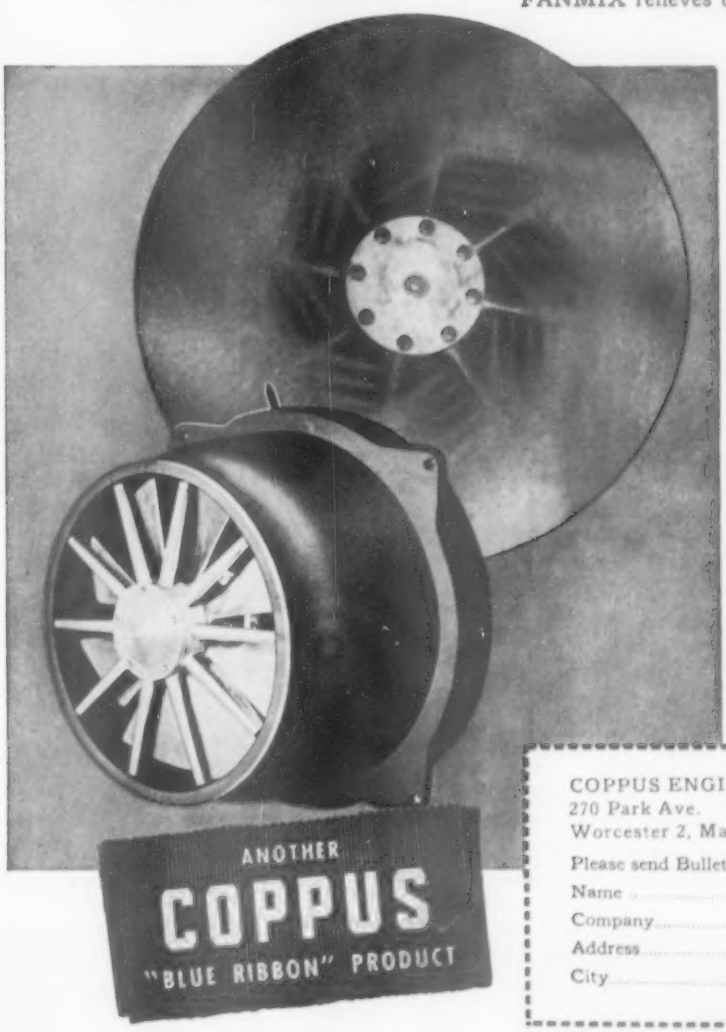

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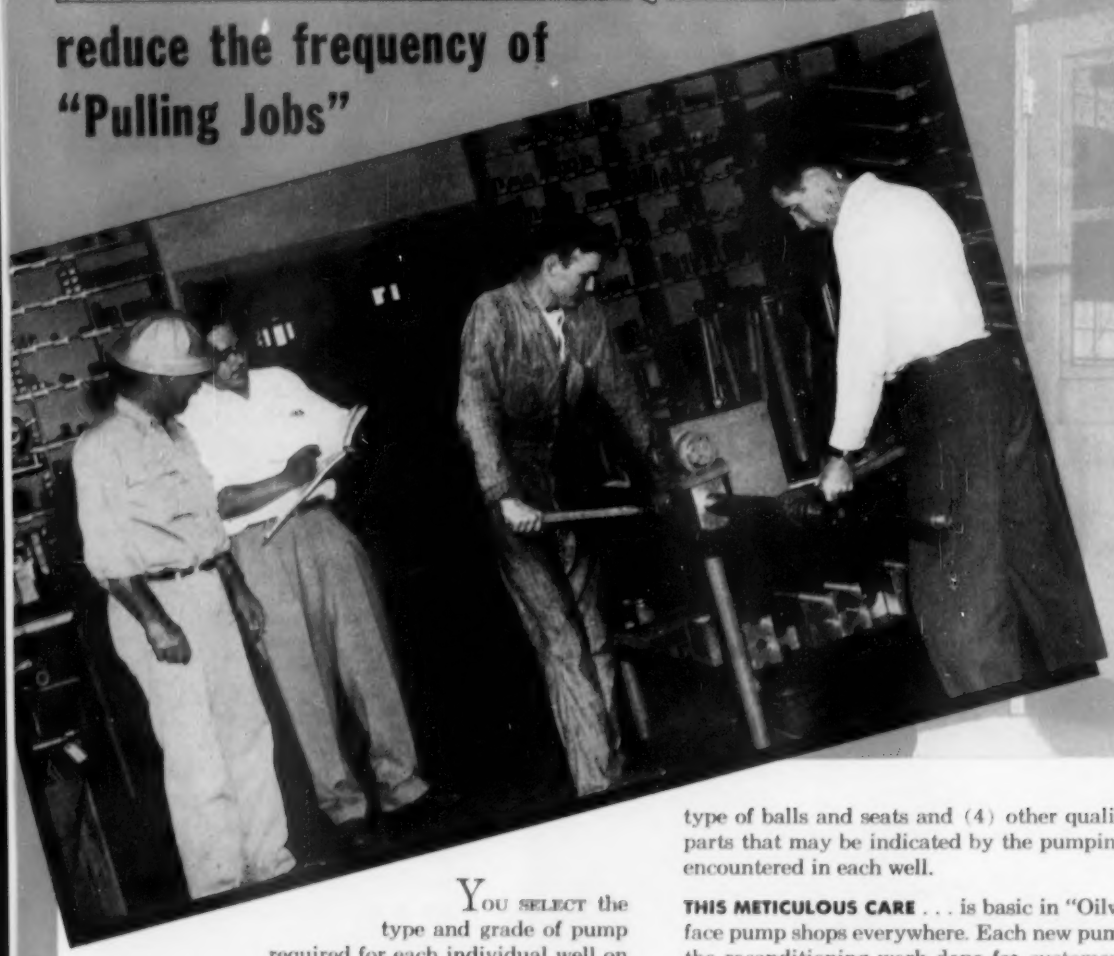

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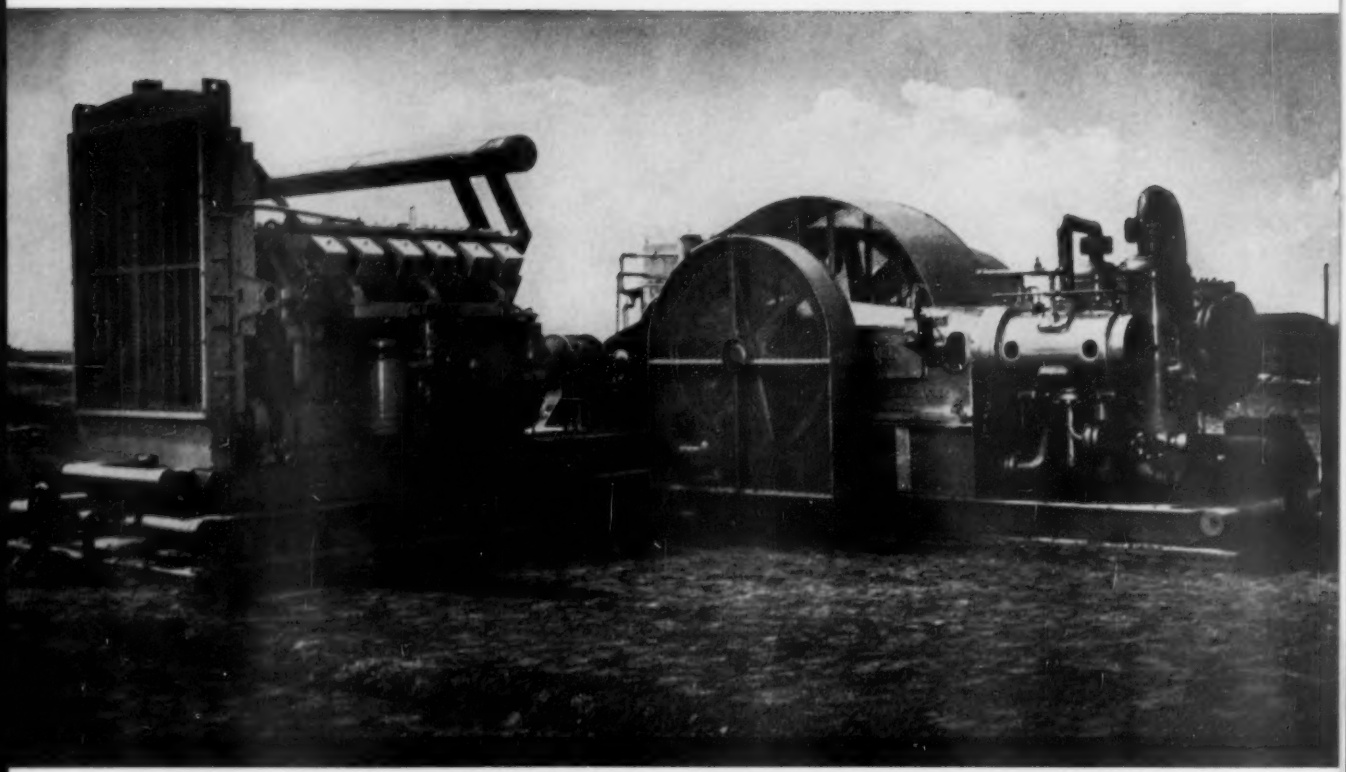

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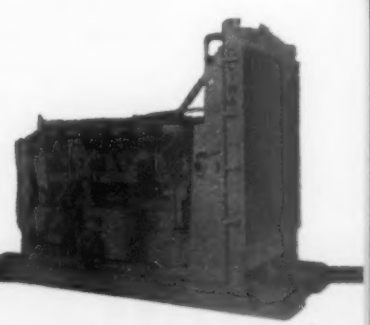

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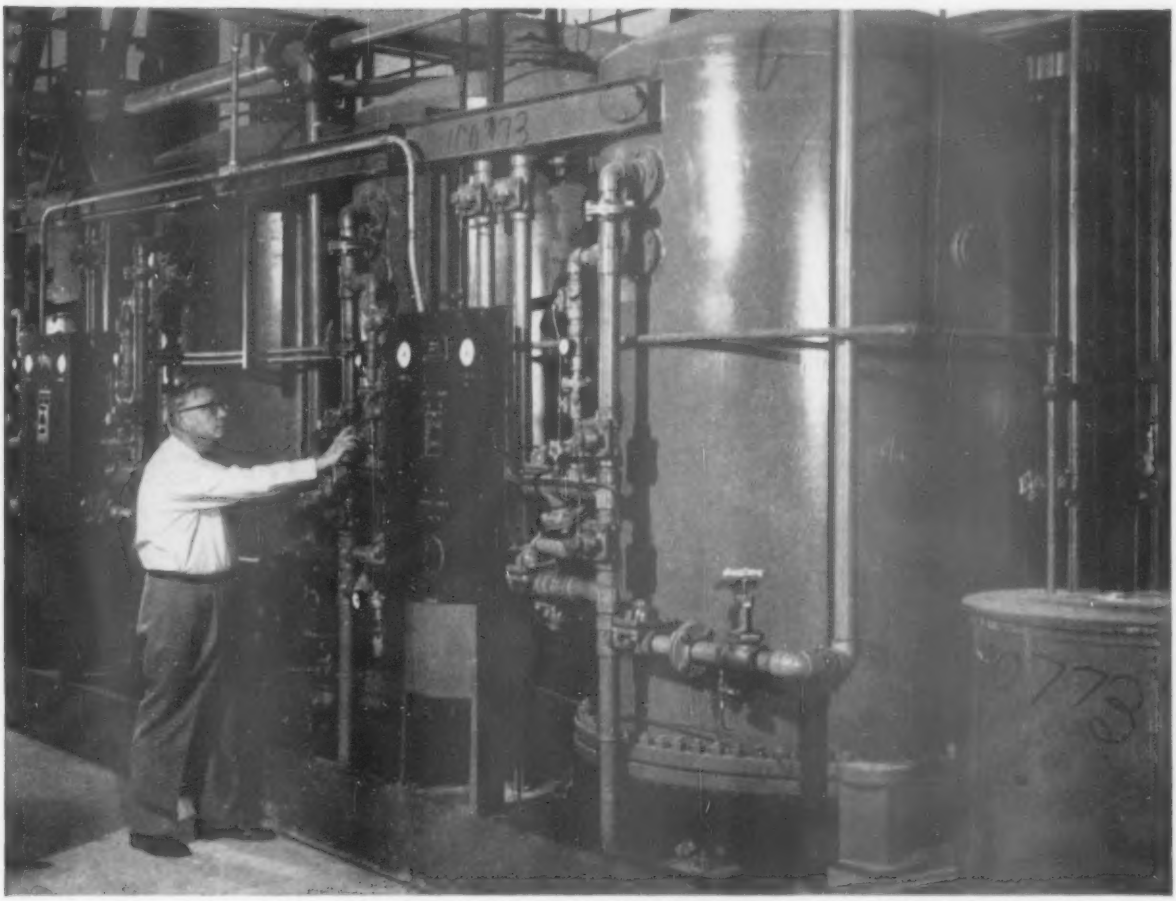

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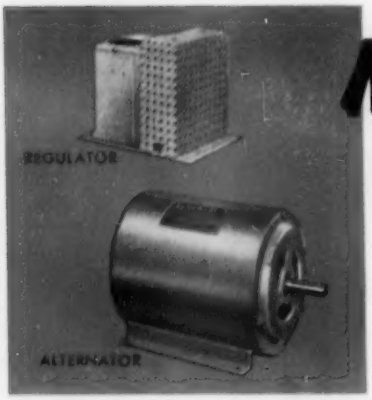

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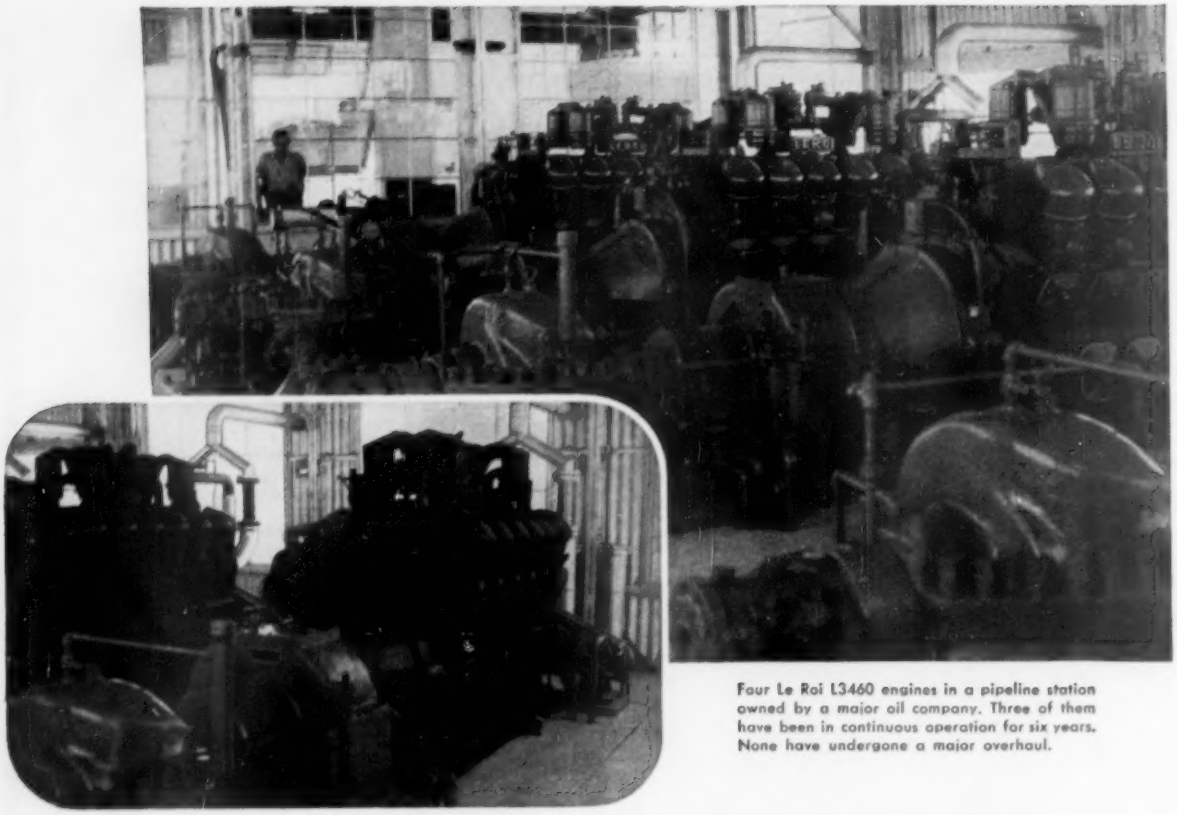

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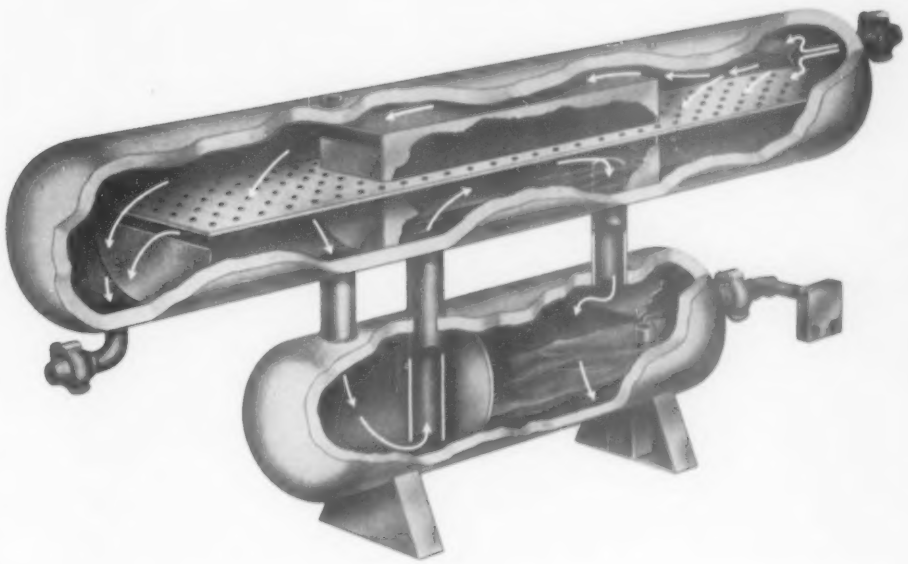

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Plant: Minden, La.; Sales and Service: Shreveport, La.; New Orleans, La.; Lafayette, La.; Perry, Okla.; Seminole, Okla.; Tulsa, Okla.; Ardmore, Okla.; Odessa, Tex.; Corpus Christi, Tex. (Lester Moore Tank & Supply Co.); Houston, Tex.; Tyler, Tex.; Alice, Tex.; and, Natchez, Miss.

The Ansul dry chemical fire equipment pictured above includes portable hand units, wheeled and stationary units and a jeep installation. Ansul also manufactures automatic dry chemical piped systems, custom engineered for the hazard. Ansul equipment is listed and approved by Underwriters' and Factory Mutual Laboratories.

Only Ansul offers a Five Year Equipment Warranty

Your assurance of fast, dependable fire protection

For you, the buyer of fire equipment, Ansul's important 5 year warranty means many extra years of fast, dependable protection. It also means freedom from costly maintenance checks and repairs.

Special design and construction features make this warranty possible. Ansul's *weather-tight* construction keeps out moisture, resists corrosion. *Patented nozzles* deliver the right kind of stream for your hazard. A *sealed pressure cartridge* puts Ansul's "Plus Fifty" dry chemical to work immediately—no delay or lag. Finally, *rugged construction* makes it possible for Ansul equipment to give peak performance under the toughest operating conditions.

Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-93, Marinette, Wisconsin. *Write Ansul for your copy of new Fire Equipment Catalog.*

ANSUL

Wherever corrosion is a problem, Kontol is playing a major part in guarding against damaging attack. Many leading producers, because of results obtained on their own leases, have adopted Kontol as the standard for comparison in all their corrosion control procedures.

Kontol's success is the result of years of research and development effort. Because of this continuing program, Kontol provides protection under many corrosive conditions since it is available in a variety of formulas, each designed to correct differing corrosion problems.

Corrosion damage can lead to well failures, extensive production losses and costly pulling jobs. The cost of prevention, measured in such terms, is insignificant. When you have a corrosion problem, be sure you adopt the best preventive measures available. A "cheap" corrosion inhibitor that affords only partial protection can be the most expensive in the long run.

Don't take chances.

Ask your Tretolite man about Kontol — today.

TRETOLITE COMPANY

A DIVISION OF
PETROLITE CORPORATION

369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

Chemicals and Services for the Petroleum Industry

DEMULSIFYING • DESALTING • CORROSION INHIBITING
SCALE PREVENTION • PARAFFIN REMOVAL • PRODUCTION STIMULATION

there's

Clark HMA-10, 440 bhp "Midget Angle" equipped for a 3-stage gas lift application.

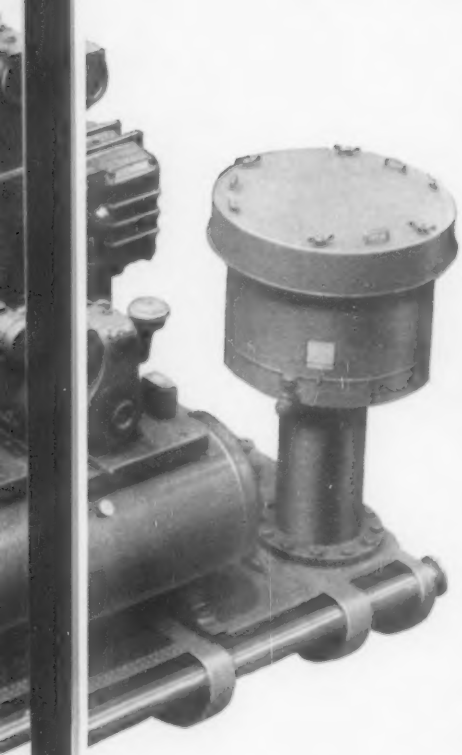
CLARK

"Midget Angles"

Clark sets the pace in compressor progress

no basis for comparison

In selecting a packaged compressor for field use, *nothing* can be compared with Clark "Midget Angles." They stand alone on so many important points. There's just no *basis* for comparison.



DESIGNED SPECIFICALLY FOR FIELD SERVICE
Every operator knows how important this is in the tough kind of service a field compressor gets.

COMPLETELY FACTORY-PACKAGED
All units fully assembled and tested in the *Clark* plant.

HIGHWAY WIDTH
Most units can be transported, fully assembled, by truck trailer and railroad.

SINGLE RESPONSIBILITY
No buck passing! All major components are built and guaranteed by Clark.

PERFECT BALANCE
Clark Balanced/Opposed principle permits operation anywhere with little foundation.

TWO-CYCLE INLINE DESIGN
For maximum power, ruggedness, simplicity, accessibility and long oil life.

RESERVE OVERLOAD CAPACITY
Ample stamina to handle temporary overloads.

RUGGED, VERTICAL-AIR-FLOW RADIATOR
Clark-built. Unequaled in durability. A Perfect Match for these "Midget Angles." Prevailing wind direction can be disregarded.

MASSIVE, RIGID, ALL-STEEL SKID
Constructed entirely of I-Beams up to 18 inches in height. (Nearly 300 ft. of them in an HMA-10 skid.)

PRECISION CONSTRUCTION
Quality materials and precision workmanship assure continuous operation with minimum maintenance.

ECONOMICAL TO INSTALL
Only a simple slab of concrete, for leveling the unit, is needed to put the "Midget Angle" on stream.

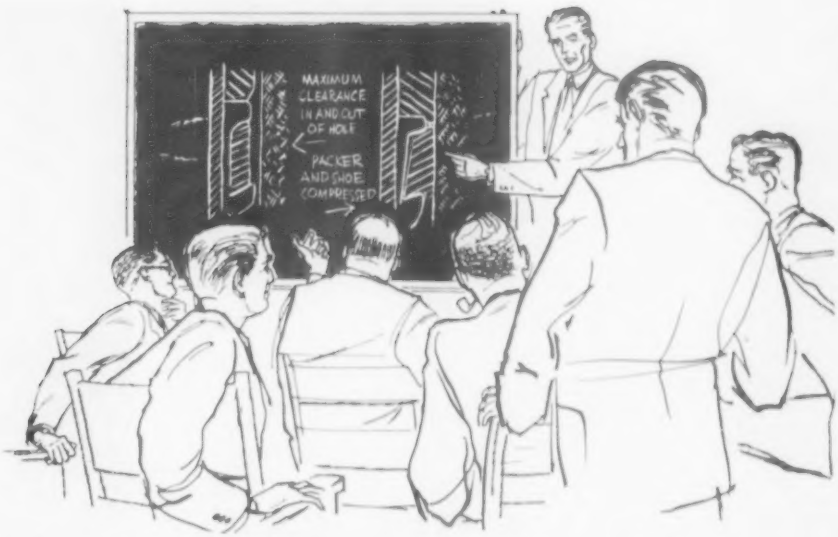
HUNDREDS OF INSTALLATIONS
Used throughout the world in every conceivable type of service.

For field gas gathering, gas lifting, repressuring, recycling plant feeders, pipeline testing and many other field uses, Clark Midget Angles are the most economical answer in the 85-440 bhp range . . . *and Clark can deliver them in a hurry!* Your Clark representative will give you facts and figures. Write for Bulletin 126.

75 YEARS

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

SEEING THE UNSEEN!
From Tuboscope research has come a line of new instruments, new techniques, new ways to **see the unseen.** Tuboscope research is closely coordinated with field practice. There are no prima donna instruments to fail and tie up your operation. Tuboscope builds for the oil fields and builds to reduce the unnecessary cost of breakdown in tubular goods.
Tuboscope can be depended on to bring the best in new methods of non-destructive testing of oil field tubular goods.
Tuboscope
COMPANY
2490 HOLMES ROAD • HOUSTON, TEXAS



PACKER EXTRUSION REDUCED BY UNIQUE EXPANDING SHOE

one of many reasons why

HALLIBURTON'S best for your drill stem test!

A most important factor in the success of deep well testing is packer performance. Packer must be specially designed and ruggedly built to seal off in the hole and resist the high pressures and mechanical loads that occur in these deep wells.

Halliburton's unique Expanding Shoe Packer meets the requirements with excellent results. The Shoe is a hard rubber, sleeve type device used below a softer rubber single end packer, and it has steel supports to carry most of the packer load. The assembly retracts to packer diameter and maintains maximum clearance going in and coming out of hole.

When packer is set the shoe expands to the wall and reduces the area available for extrusion. This reduction or elimination of extrusion minimizes the danger of stuck packers, damage to formation, rubber left in hole, excessive jarring and pulling, mis-runs in over sized holes, and saves much time in making test.

Efficient packer performance is one of the many reasons why Halliburton's best for your drill stem test. Your testing operator will show you all the advantages of Halliburton's Testing Service that can make your job easier, better, more successful. Phone your local or district office of the Halliburton Oil Well Cementing Company.

HIGH QUALITY RUBBER PACKER

For sealing against formation

STEEL SUPPORT

Carries most of packer load

STEEL SHOE

Supports expanding shoe rubber. Protects rubber while running in hole

HARD RUBBER EXPANDING SHOE

Provides support for that part of the packer rubber which tends to extrude over the steel support

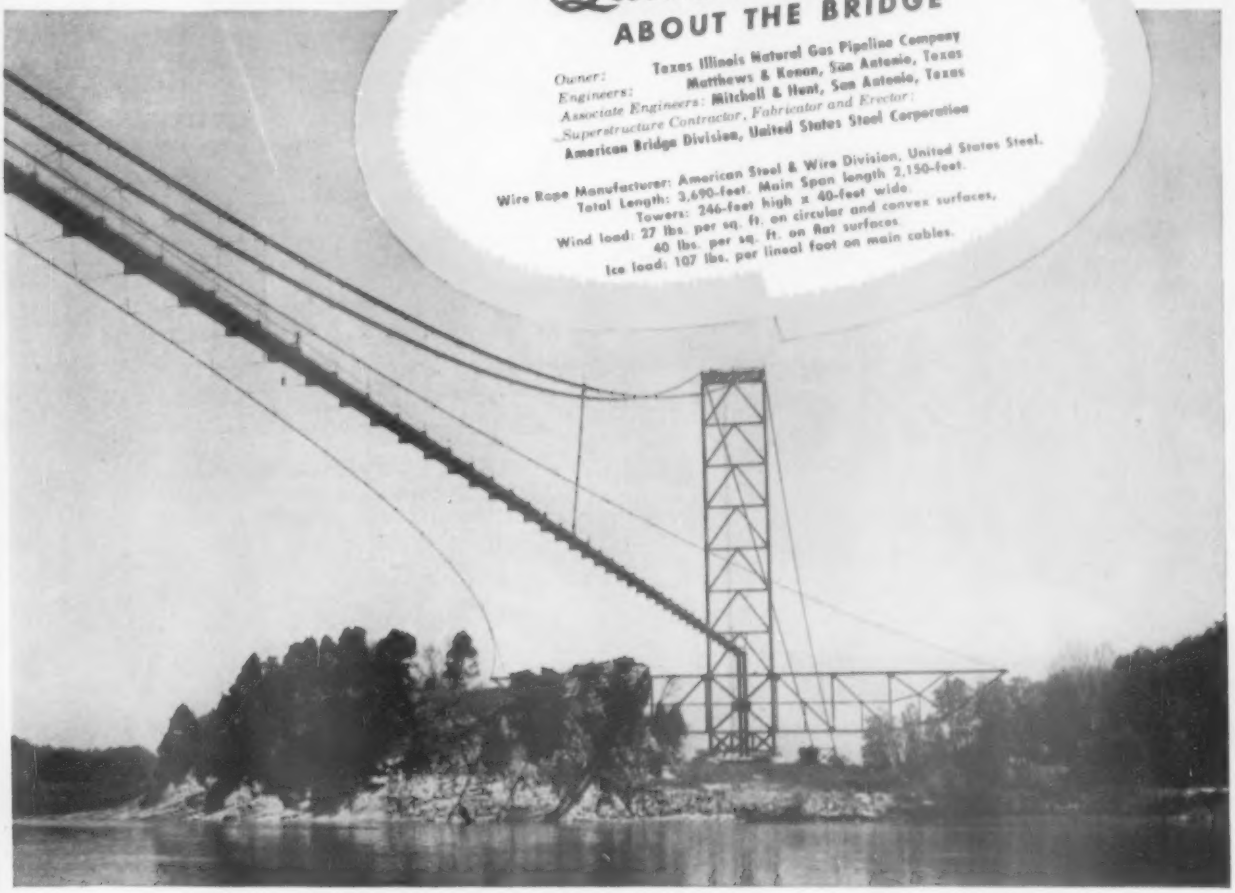
HALLIBURTON
TESTING SERVICE

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

The supporting cable network consists of 174 main cable suspenders (vertical), 61 main cable horizontal ties, 170 wind cable horizontal guy suspenders, 168 wind cable inclined suspenders and 44 wind cable inclined suspenders in backstays. Most of these are Tiger Brand 5/8" strand with four 3/4" strands at the towers.

TEXAS ILLINOIS GAS jumps the Mississippi on World's Longest Pipeline Suspension Bridge

Two main cables of open type support the pipelines. Each cable consists of twelve 2" dia. Tiger Brand Wire Ropes, prestressed to eliminate stretch, galvanized for long life. In addition, there are two wind cables, each of two 2 3/8" dia. prestressed and galvanized wire ropes.


Quick Facts
ABOUT THE BRIDGE
Owner: Texas Illinois Natural Gas Pipeline Company
Engineers: Mathews & Kenan, San Antonio, Texas
Associate Engineers: Mitchell & Hent, San Antonio, Texas
Superstructure Contractor, Fabricator and Erector:
American Bridge Division, United States Steel Corporation
Wire Rope Manufacturer: American Steel & Wire Division, United States Steel.
Total Length: 3,690-feet. Main Span length 2,150-feet.
Towers: 246-feet high x 40-feet wide.
Wind load: 27 lbs. per sq. ft. on circular and convex surfaces.
40 lbs. per sq. ft. on flat surfaces.
Ice load: 107 lbs. per lineal foot on main cables.

It took 445 tons of Tiger Brand Galvanized Bridge Rope and fittings to build this 3,690-foot bridge carrying two 30-inch gas pipelines across the Mississippi River.

The Mississippi River has been rough on pipelines laid across its bottom. Some have been undermined and washed out, disrupting service. To prevent situations like this, the Texas Illinois Natural Gas Pipeline Company has built the first pipeline suspension bridge across the Mississippi River near Grand Tower, Illinois.

The bridge has a main span of 2,150-feet and measures 3,690-feet from anchor to anchor. The main towers extend 246-feet above the concrete supporting piers and the pipeline, at the center span, will be some 75-feet above the highest recorded level of the river at that point. Actually, it will average about 110-feet above the normal height of the river.

This pipeline bridge which will aid in the distribution of Texas gas to Chicago, Illinois, represents some of the world's finest engineering in the design, manufacture and application of wire rope. One of the most difficult jobs in building the bridge was adjusting the cables in the high winds of early spring. The successful completion of the job is a tribute to the cooperation of all those involved.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO - TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

These companies too use non-corroding KRALASTIC pipe

chemical pumping... **OLIN MATHIESON CHEMICAL CORP.,** Baltimore, Maryland. Kralastic replaces 3,000 ft. of rubber-lined steel for piping 25% ammonium sulphate—installed 1953.

oil-flow lines...THE OHIO OIL CO., Robinson, Illinois. Kralastic pipe replaces 12,000 ft. of steel pipe—installed February 1954.

salt-water disposal...NATIONAL COOPERATIVE REFINING ASSOCIATION, Wichita, Kansas. 50,000 ft. of Kralastic pipe for salt-water disposal and oil-flow lines—since 1951.

But WHY Kralastic for severe corrosive conditions?

BECAUSE Kralastic pipe *can't rust or rot*—is free from electrolytic action—highly resistant to most chemicals, to scaling and paraffin build-up—impervious to water and soil elements. And it never needs coating, lining, or anode protection. In addition, the extremely smooth internal walls minimize back pressure.

A unique combination of plastic and elastomeric materials, Kralastic offers superior physical properties that no other pipe material can match. The resin-rubber blend makes Kralastic *hard, tough,* and resistant to most chemicals. It also gives Kralastic extremely high impact strength—even at Arctic temperatures. The butadiene type rubber used is oil and chemical resistant.

Kralastic pipe can be quickly and easily solvent welded by unskilled workers. Or it can be threaded for use with threaded fittings. Because Kralastic® is unusually light weight (about 1/7th the weight of iron pipe) you need no heavy handling equipment—no costly bedding.

For more about this amazingly tough and durable plastic pipe material and the advantages it offers you, write to us on your company letterhead, today.

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

Does your process call for *drying?*

Reynolds Activated Alumina Removes 12,500 Gallons of Water Per Hour in Operation of Supersonic Tunnel

At Lewis Flight Propulsion Laboratory, Cleveland, the 10x10 foot Supersonic Tunnel above has a design capacity of 1,440,000 cfm. Low cost Reynolds Activated Alumina is used in six large beds totaling 25,000 square feet to reduce this volume of air to a dew point of —40° F. (Inlet conditions; 85° F dry bulb, 78° F wet bulb, 68° F dew point.) In some applications, Reynolds Activated Alumina will adsorb up to 22% of its weight. It can be regenerated repeatedly by heating with little loss of efficiency.

Reynolds regional offices offer you the service of staff engineers and other specialists in the use of aluminum chemicals, shipping containers and mill products. For your copy of Free Brochure "Reynolds Aluminum Chemicals", write *Reynolds Metals Company, P.O. Box 1800-CR, Louisville 1, Kentucky.*

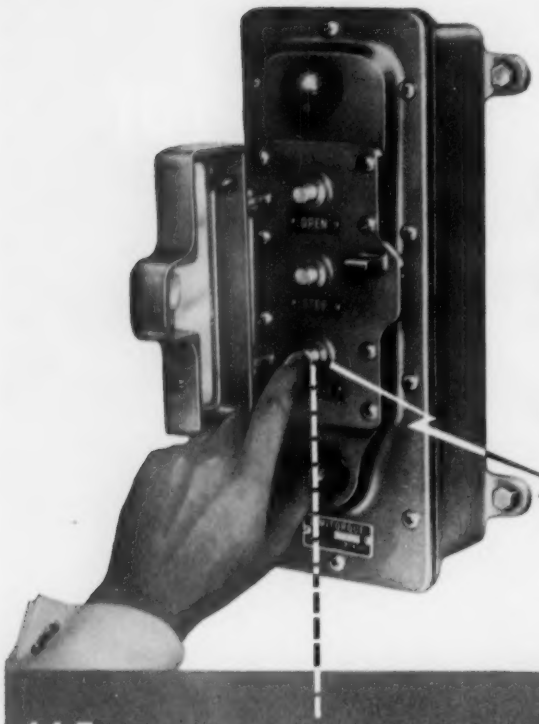
Reynolds Activated Alumina Used in HF Alkylation at Texas City Refining

The use of Reynolds Activated Alumina at Texas City Refining Inc. reflects the high suitability of this material for drying of hydrocarbon feeds in many processes such as HF alkylation.

Reynolds Activated Alumina in these processes provides elimination of silica migration, better fluoride removal and thorough drying of alkylate while in process.

REYNOLDS CHEMICALS

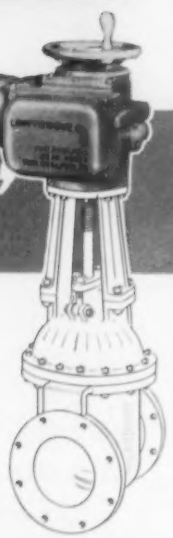
BY THE MAKERS OF REYNOLDS ALUMINUM



truly *Automatic* VALVE OPERATION

with **Limitorque®**

"just press the button"



The above is a Type SMA-000 LimiTorque for operating smaller valves. There's a type and size of LimiTorque for every valve operating need.

Think of the time, labor and money that can be saved by opening and closing valves in remote, inaccessible or distant locations with LimiTorque . . . automatically, from a centrally located control panel. LimiTorque not only operates valves at the speed required, but it "limits the torque" applied to the valve operating parts and thus prevents damage to stems, seats, discs or gates . . . and too, the handwheel "cannot rotate" when the valve is being motor-operated. LimiTorque may be actuated by any available power source; such as electricity, gas, steam, water, oil or air—and is readily adapted for Microwave Control. Thousands of these units are being used in Power Plants, Oil Refineries and Pipe Lines, Water and Sewage Plants, Chemical Plants, Pulp and Paper Mills, and on Shipboard.

Send for Catalog L-54, and be convinced.

PHILADELPHIA GEAR WORKS
INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
BALTIMORE • CLEVELAND

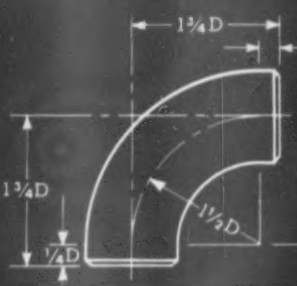
LimiTorque Corporation—Philadelphia

Industrial Gears & Speed Reducers • LimiTorque Valve Controls

ESTABLISHED 1892

The Unequalled Variety of MIDWEST ELBOWS will Save Money and Simplify Design of Your Welded Piping

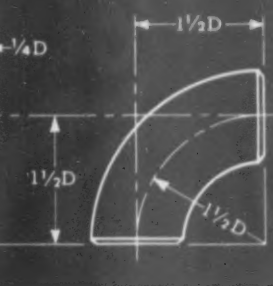
1
LONG RADIUS LONG TANGENT



SIZES: 2" thru 36"

A premium fitting at the same price as regular long radius elbows, but with LONG TANGENTS on both ends . . . an exclusive Midwest feature that saves time and pipe.

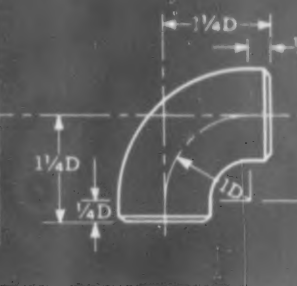
2
LONG RADIUS ASA TYPE



SIZES: ¾" thru 36"

Dimensions conform to the American Standard for Steel Butt-Welding Fittings, ASA B16.9, and the Manufacturers Standardization Society Specification DS-11.

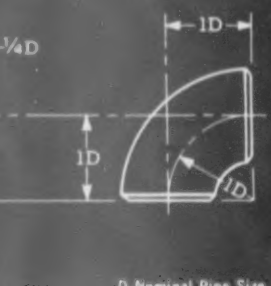
3
SHORT RADIUS LONG TANGENT



SIZES: 14" thru 36"

Developed for those installations that require an elbow with a short radius, yet this elbow provides all the additional advantages of Midwest "Long Tangents".

4
SHORT RADIUS

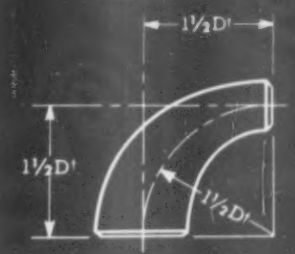


SIZES: 1" thru 36"

Where space limitations prevent the use of Midwest "Long Tangent" or ASA long radius elbows, these short turn elbows without tangents are recommended.

D-Nominal Pipe Size

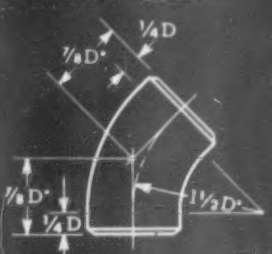
5
LONG RADIUS REDUCING



SIZES: 2" thru 16"

This elbow takes the place of two fittings . . . a straight elbow and a reducer, thus saving space and one weld. Only Midwest makes the reducing elbow in this size range.

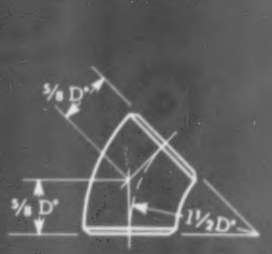
6
LONG RADIUS LONG TANGENT



SIZES: 2" thru 30"

The Midwest "Long Tangent" type is also available in 45° elbows at no increase in price. These tangents simplify the assembly of fitting to pipe or flange.

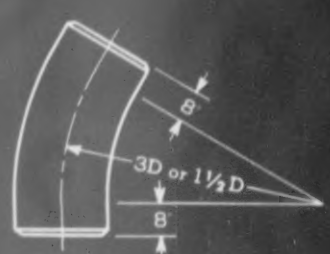
7
LONG RADIUS ASA TYPE



SIZES: ¾" thru 36"

Like all Midwest Elbows, these 45° elbows are selectively reinforced to compensate for the higher stresses that occur in the throat of all elbows subjected to internal pressure.

8
CONTUR-ELLS



SIZES: 22" thru 30"

Primarily designed for the gas transmission industry, these are available in small angles, with 8" tangents on both ends, and in carbon steel or high-yield steels.

†-Larger Nominal Pipe Size

*-Approximate Value

Exceptional latitude in piping design and economy in erection . . . that's why the unequalled variety of Midwest Elbows is becoming increasingly popular. For example, the Midwest "Long Tangent" Elbow saves pipe . . . permits faster, easier, more accurate lining up . . . often eliminates a short nipple and its extra weld . . . costs no more than other elbows. For all the advantages to be gained by specifying Midwest Elbows, see Catalog 54; ask our distributor for a copy or we shall be glad to send it to you.

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St. • Cleveland 14—616 St. Clair Ave. • Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave. Tulsa 3—224 Wright Bldg. • Miami 34—2103 Le Jeune Rd. • Boston 27—426 First St.

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MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs

6734

IT'S MORE THAN A SIGN OF QUALITY

CARBIDE
AND CARBON
CHEMICALS

it's a symbol of over 20 years' service to the gas-treating industry

MONOETHANOLAMINE
DIETHANOLAMINE 〉 **for H_2S and CO_2 removal**

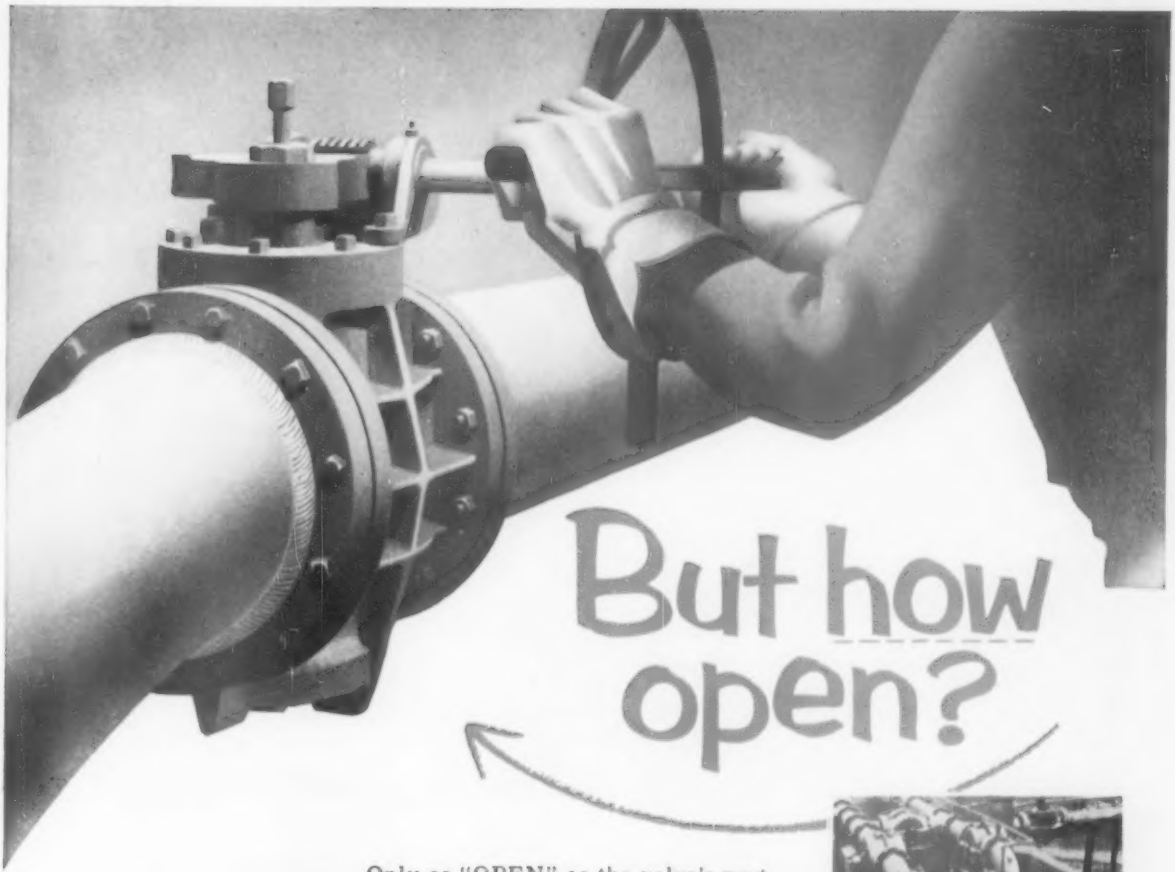
DIETHYLENE GLYCOL
TRIETHYLENE GLYCOL 〉 **for H_2O removal**

Yes, you get more than the best gas-treating chemicals at CARBIDE. You also get these *extra* benefits.

- the services of CARBIDE technical representatives.
- laboratories that devote a great deal of time to advancing knowledge in this field.
- the "know-how" accumulated over more than twenty years by the first producer of these chemicals.
- a national distribution network of 49 warehouses and 14 bulk storage depots to assure you of continuous supply and rapid delivery. Shipments are made in tank cars, tank wagons, and drums in carload or truckload lots.

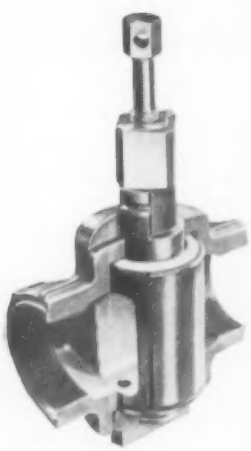
CARBIDE and CARBON CHEMICALS COMPANY

A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York
Offices in Principal Cities



But how open?

Only as "OPEN" as the valve's port opening! If the opening is smaller than the pipe ...then a valve cannot be COMPLETELY "OPEN" in any position!

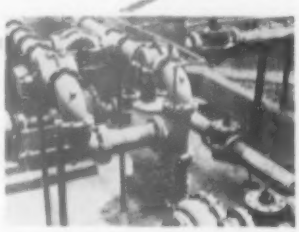


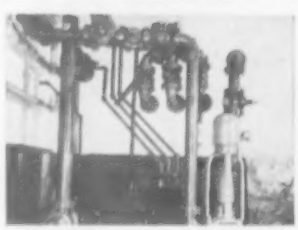
For a really "OPEN" flow...specify **acf** Rectangular Port Valves. With a port opening the same area as the pipe itself...they assure smooth-running, trouble-free operation by keeping down turbulence and harmful abrasive action caused by solids in suspension. They also minimize loss of head pressure...especially important when handling the extra heavy fluids used in the processing industries.

And, of course, all **acf** *Cylindrical* Lubricated Plug Valves...with rectangular or round port openings...feature "split-second" shut off, TEFLON* head gaskets, and many other design advantages. Representatives in 50 Principal Cities.

Write for descriptive Catalog 9-OG, **acf** Industries, Incorporated, Valve Division, 1501 E. Ferry Avenue, Detroit 11, Michigan.

*DUPONT TRADENAME





acf Plug Valves are backed up by Proof-of-Performance in every Processing Industry.

acf CYLINDRICAL FULL PIPE AREA **PLUG VALVES**

Someone has a marine problem . . .
Someone gets hold of Higgins . . .

The team that built the Famous Higgins Boats goes into action—fast!

Ready For Anything in oil or marine construction — that's the spirit of the entire Higgins team. This is a team headed by men whose ideas and ingenuity have produced specialized craft never before heard of, who made Higgins wartime craft world-famous.

Specifications are followed to the letter—and to the satisfaction of the most meticulous customers.

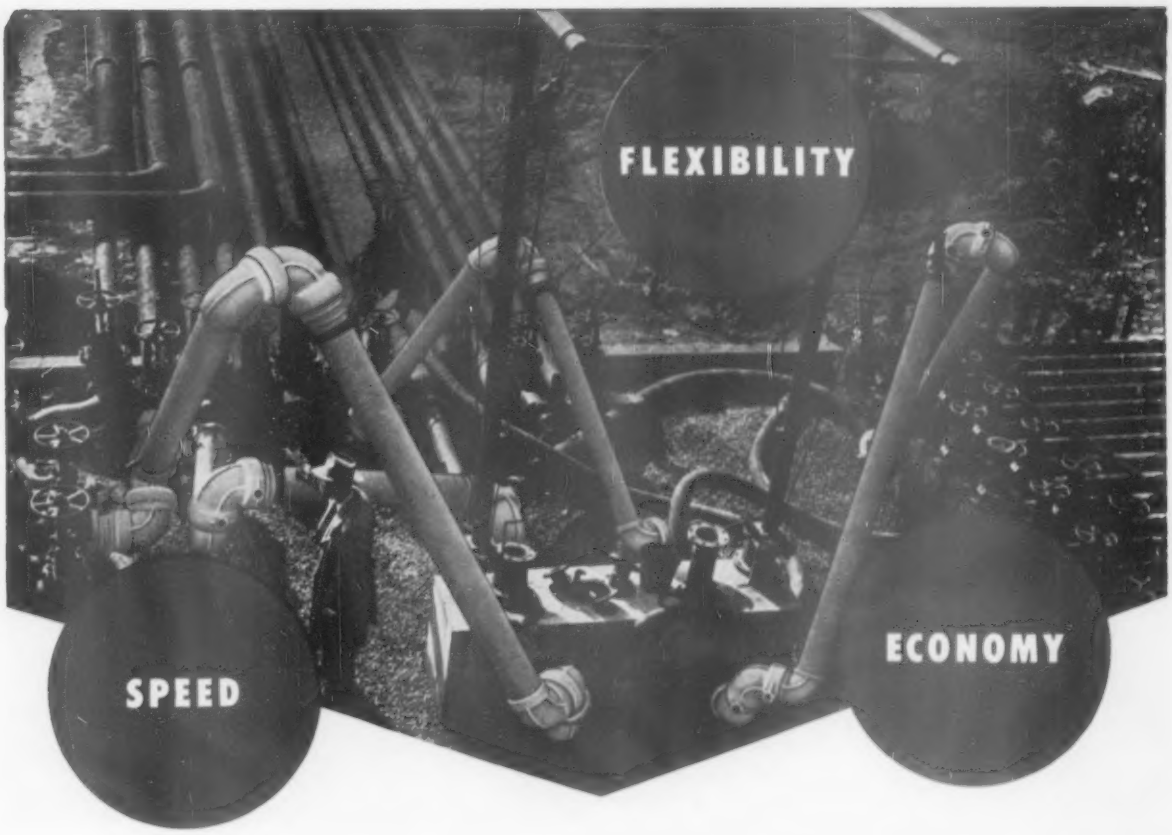
Ample work space, ample equipment are available at Higgins to make possible an efficient, cost-saving flow of work throughout the plant. No matter what *your* construction problem, why not let the famous Higgins team work it out for you—*right* on time!

Q. Got a marine problem? **A. Get hold of Higgins INC.**

Box 8001 . New Orleans 22, La. . CRescent 0631

THE NAME THAT MEANS DEPENDABILITY TO OUR FIGHTING FORCES

DRILLING BARGES • DREDGES • BARGES • QUARTER BOATS • TUGS • WORK BOATS • COMMUNICATION CRAFT • DRILLING STRUCTURES • PERSONNEL BOATS • PLEASURE BOATS • SEISMOGRAPH BOATS • BULK-TYPE CARGO BARGES • SWAMP SKIPPERS • TANK BARGES • ALSO MARINE REPAIRS OF ALL TYPES



CHIKSAN Manifolding Saves 3 Ways!

- √ ORIGINAL INSTALLATION
- √ NO CONTAMINATION LOSSES
- √ LOW COST OPERATION

Original cost of CHIKSAN flexible line manifolding installations often run as much as 50% less than fixed line manifolding operations which incorporate costly multiple valve and line systems.

A CHIKSAN manifolding operation is simplified in its entirety—providing complete flexibility, mobility and ease of operation in limited spaces.

CHIKSAN manifolding installations reduce line hook-up time—keep pit floor clear of lines thereby providing greater working areas.

CHIKSAN manifolding operations facilitate the transfer of all types of fluids safely and rapidly under extreme climatic conditions with no possibility of cross contamination.

CHIKSAN manifolding installations are specifically engineered for long life—easy and economical maintenance, and render years of trouble-free operation.

Our Engineering Research and Development Department will welcome inquiries on your manifolding problems.

Write for Catalog G-4, Dept. 39

CHIKSAN Swivel Joints illustrated in this installation, facilitate the speedy, economical handling of various fluids through 16 lines from loading dock to manifolding pit—a distance of 800 feet. Since each line leads to a separate tank through the manifold, cross contamination is eliminated.

CHIKSAN Swivel Joints in the pump manifold above enable operator to pull base stock from outside storage into the plant and direct flow to proper vessel or proportioner.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X895-12, Electronics Park, Syracuse, N. Y.*

INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

◀ There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

Progress Is Our Most Important Product

GENERAL ELECTRIC

THERE'S SOMETHING NEW ON THE LINE

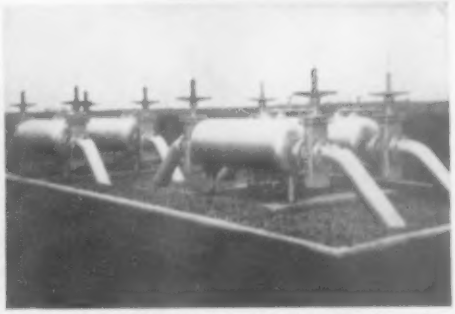
wherever products, crude or gas are flowing, you'll continue to see more and more of these

NEW GROVE SEAL-"O"-RING FABRICATED STEEL GATE VALVES

Opening a whole new realm of gas and petroleum pipe line applications, the Grove fabricated steel through-conduit valve body introduces a new concept of design flexibility, safety and dependability. Full opening or Venturi types are available with flanged or welding ends for 2" to 36" lines in ASA Series 150, 300, 400 and 600. For the full story on the valve of tomorrow – already proved in use today – contact your Grove representative, or phone, write or wire for details.

505

This is one of several carloads of new Grove Seal-"O"-Ring fabricated steel gate valves en route to a major gas pipeline.



Bubble-tight seal, with flow in either direction, plus freedom of operation of Grove Seal-"O"-Ring Valves is important on products line installations of this type.

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • **LOS ANGELES 6** — 1930 W. Olympic Blvd.

ODESSA, TEX. • TULSA, OKLA. • LAFAYETTE, LA. • CHICAGO, ILL. • DENVER, COLO. • In Western Canada: GROVE VALVE LIMITED

AURORA
FIRST
WITH
Rexfo
TRADE

To meet the increasing demands for higher octane gasolines, Aurora Gasoline Company is installing facilities for the operation of the UOP Rexforming process—the first commercial installation of this newest catalytic reforming process.

The new facilities, to be installed at Aurora's Detroit, Michigan, refinery, will produce a high-octane blending component for the company's gasoline outlets. It is expected that the Rexforming unit will be placed in operation within the next five months.

The Rexforming process, capable of producing gasolines with octane ratings in excess of 100 clear, was developed by Universal Oil Products Company to provide the entire petroleum refining industry with a tool which will permit them to keep pace with the requirements for high octane motor fuels.

r m i n g

MARK

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD,
DES PLAINES, ILL., U.S.A.

Universal Service Protects Your Investment

You can do it CHEAPER with

UTILITY Electric Power

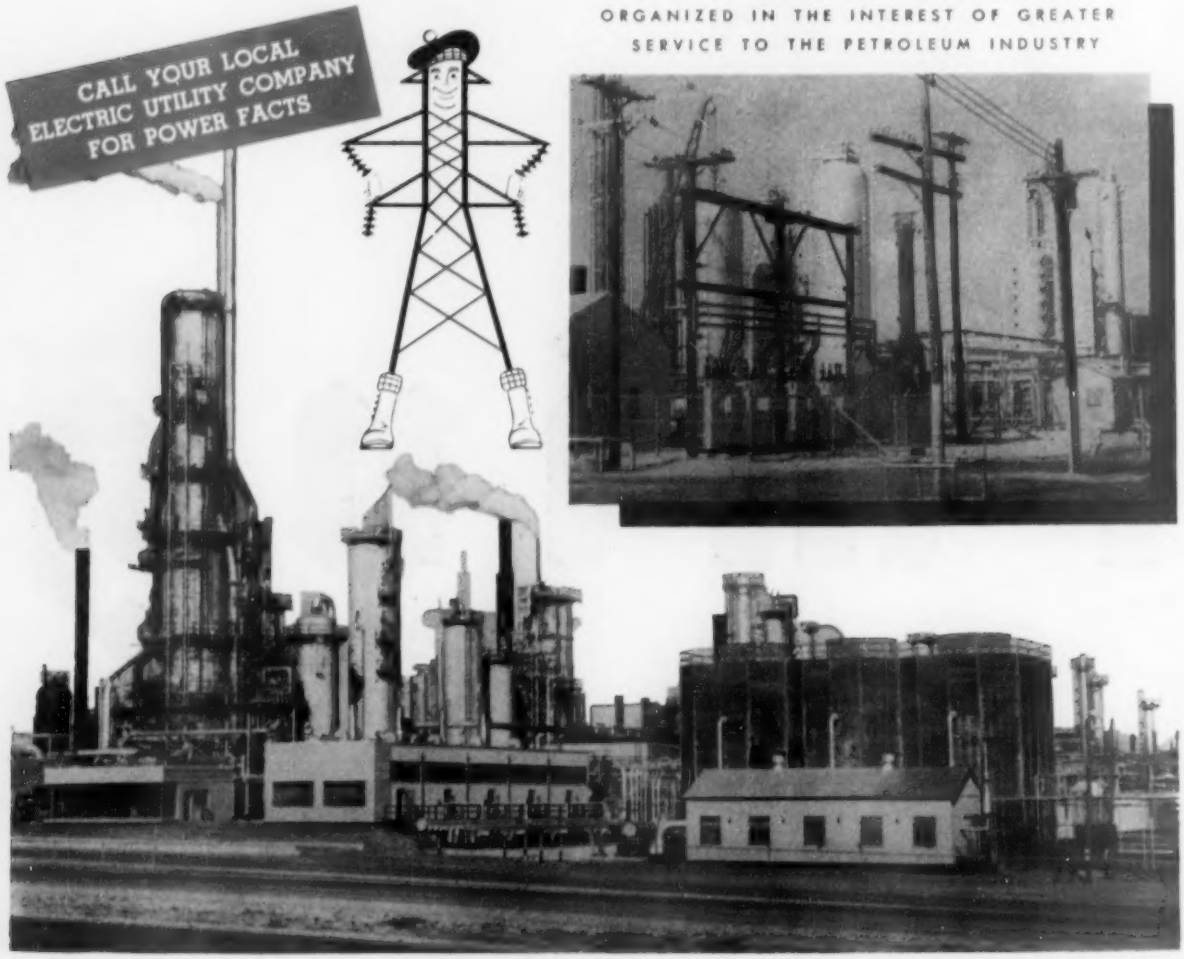
Refineries. Petrochemical Plants. Field Processing Plants- they all use Utility Electric Power

because Electric Power is flexible . . . compact . . . dependable . . . safe . . . clean . . . and can be installed at a Low Capital Investment, with LOW COST operational advantages, plus many other money saving features, including convenient automatic control.

Petroleum Electric Power Association

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY



NEW H-5

1/2-YD., 9-TON

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

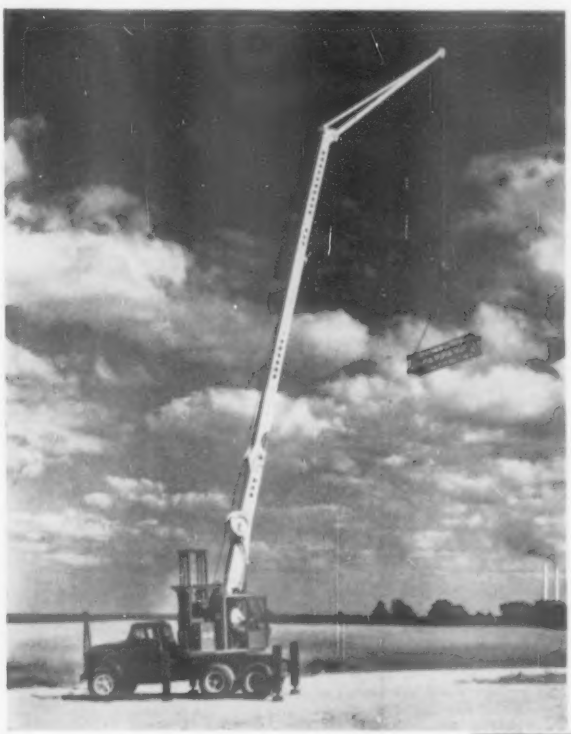
Gentlemen:
Send me your new H-5 Bulletin. This crane interests me for _____ work.
(type of job)

Name _____
Company _____
Title _____
Address _____
City _____ State _____

91H55

Hydrocrane Mounts on Conventional Truck

Completely new from outrigger feet to boom tip, this powerful 9-ton, ½-yd. Hydrocrane brings you work ability of heavy carrier-mounted cranes at small crane cost. Patented hydraulic outriggers permit mounting crane-excavator on a commercial motor truck, new or used, without sacrificing any basic crane working capacity.



Check these outstanding advantages—

Unmatched precision control of loads.

High-lift, three-piece boom (extra equipment at added cost) gives you 50 feet of reach, retracts hydraulically to 25 feet for travel. Boom and hydraulic fittings can be connected and machine working in less than ten minutes after arrival at job site.

12-ft. telescoping boom action—from 24 feet to 36 feet for standard two-piece boom, from 38 feet to 50 feet for high-lift boom, plus 20-ft. jib extension.

50-mph top highway speed.

Every work function fully hydraulic.

Up to 240-fpm line speed.

Available with clamshell, crane hook, magnet.

Optional remote truck control from crane cab.

Meets highway laws for over-all length and axle loads (depending on truck selection).

See it in action

Find out what the new H-5 Hydrocrane can do for you. Ask your Bucyrus-Erie distributor for a demonstration.

BUCYRUS-ERIE COMPANY
1880 South Milwaukee, Wisconsin **1955**
75 Years of Service to Men Who Shape the Earth

New truck, inexpensive used truck, a truck you now own—the new H-5 Hydrocrane can be mounted on any standard commercial truck you choose.

Here are a few of the many improved features which help make the new Dean Hill Vertical Turbines your best power-package buy:

1. **MORE POWER**—An added steam nozzle for Models DH-10V (new in vertical line) and DH-20V increased power *100%* over former one-nozzle counterparts. The DH-30V now has three steam nozzles and 50% more power.
2. **BETTER PERFORMANCE**—Two hand valves improve regulation of steam rate at reduced load. Improved packing boxes check steam pressure leakage and permit higher back pressures.
3. **LONGER SERVICE**—*Double-row* ball bearing has greater thrust capacity. Overlapping labyrinth slinger on lower bearing prevents moisture seepage.
4. **POSITIVE SAFETY**—Improved emergency trip mechanism has cylindrical guide to maintain alignment of trip valve stem in all positions.

MORE DETAILS?

You will want to study the other improvements in the DH line . . . improvements made to increase the useful life and efficiency of the turbine without sacrificing the compactness and simplicity of design. Write now for our new Catalog No. 500, which includes full details on both Vertical and Horizontal DH Turbines.

DEAN HILL PUMP COMPANY

Pump and Turbine Engineers Since 1893

Indianapolis 7, Indiana

Sales Offices In: Chicago, New York, San Francisco, Boston, Cincinnati, Denver, Albuquerque, El Paso, Salt Lake City, New Orleans, Philadelphia, Tulsa, Los Angeles, Pittsburgh, Houston, Dallas, St. Paul, Toledo, Cleveland, Grand Rapids, Birmingham, Ala., Louisville, Memphis, Richmond, Mexico City, Montreal, Reading, Pa., The Hague, Washington, Charlotte, Casper, Wyo., Knoxville.

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

NATURAL GAS STORAGE COMPANY of Illinois developed the Herscher Dome project to provide initial underground storage for 25 billion cubic feet of natural gas. Shortly after opening the field, which covers an area equaling 24 square miles, leakage appeared which hampered utilization of the field to the degree originally planned.

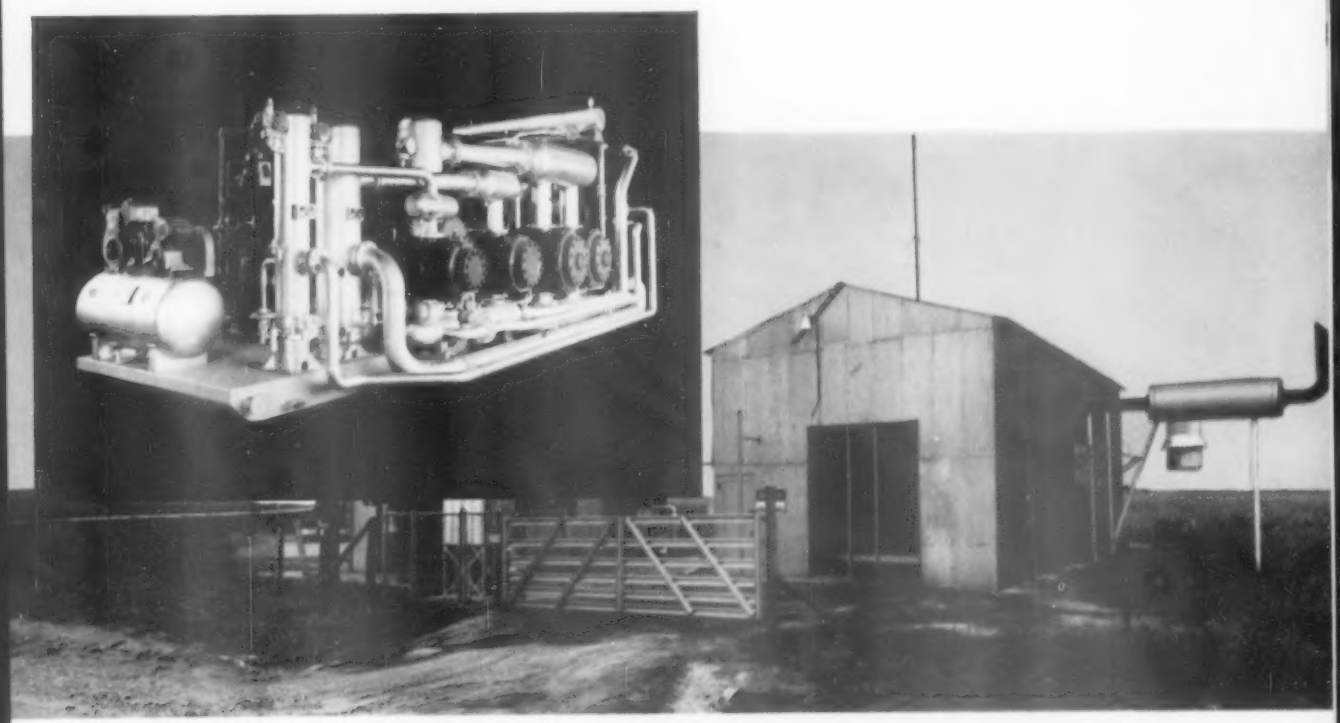
A unique solution to this complex problem was developed by the Natural Gas Storage engineering staff. A field compressor station, equipped with a 12 SVG 660 h.p. Beaird-Ingersoll-Rand packaged compressor plant, was installed near Herscher. Ten existing venting wells were tied into a pilot vent gas gathering system which was connected to the station. Operating with three stages of compression the unit picks up vent gas from the wells at 2 psig and re-injects the gas into the storage sand at approximately 700 psig. This method of vent gas control has proved to be a practical operating procedure.

Handling 2.6 MM cu. ft. of recovered vent gas per day, the unit is equipped with automatic controls which permit it to be operated without attention except for scheduled servicing. Shipping the compressor, fully assembled, directly to the plant site saved valuable time in putting the gathering system into operation.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your special requirements.

At Herscher Dome –

PACKAGED COMPRESSOR UTILIZED FOR PILOT LEAKAGE CONTROL SYSTEM



NATURAL GAS STORAGE COMPANY'S Herscher Dome gas storage recovery project compressor station, Herscher, Illinois—equipped with a Beaird-Ingersoll-Rand 660 h.p. 12 SVG four cycle gas engine driven compressor, Young radiator and all necessary controls. Other sizes 110- to 660 h.p.

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

BEAIRD

PACKAGED COMPRESSOR PLANTS · CAST STEEL FITTINGS · PRESSURE BULK STORAGE · ANHYDROUS AMMONIA EQUIPMENT · LP-GAS SYSTEMS

MACHINING • MANUFACTURING • STEEL WAREHOUSE

200,000,000 GALLON STOREHOUSE

Industry, too, stores up the fruits of a busy summer to meet winter needs. This seasonable balancing of supply and demand is especially critical with industries making volatile products that require pressure storage. Since 1918, these industries have depended on storage vessels built by Beaird's pressure storage division.

Now producing over 42,000 gallons in storage daily, the pressure storage division has supplied industry with more than 200,000,000 gallons of reserve capacity. This combination of experience, know-how and facilities merges with those of four other Beaird manufacturing divisions to bring the customers of all five the finest products for their industries.

Let us quote on your standard or special storage requirements. Write: The J. B. Beaird Company, Inc., Shreveport, Louisiana.

Beaird's pressure storage division serves refineries, LP-Gas marketers, anhydrous ammonia manufacturers, chemical processors — and many allied petro-chemical industries.

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

BEAIRD

MACHINING
FABRICATING
STEEL WAREHOUSE

STOP RUST!

with

RUST-OLEUM®

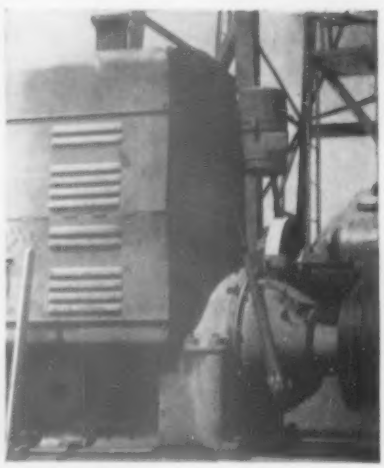
and match original equipment

COLORS

Resists Salt Air, Salt Water, Sun, Heat, Fumes, Blowing Dust and Sand—Yet Dries Quickly and Hard to a High Gloss Finish!

Do the job right in the field—right over the sound rusted surface! Just scrape and wirebrush to remove rust scale and loose rust — then brush or spray Rust-Oleum 769 Damp-Proof Red Primer (or H-50 Primer) over the remaining rust. Then—follow-up with the Rust-Oleum finish coat to match the original manufacturer's colors. That's all there is to it. Applied over rust—Rust-Oleum keeps your equipment looking better . . . LONGER!

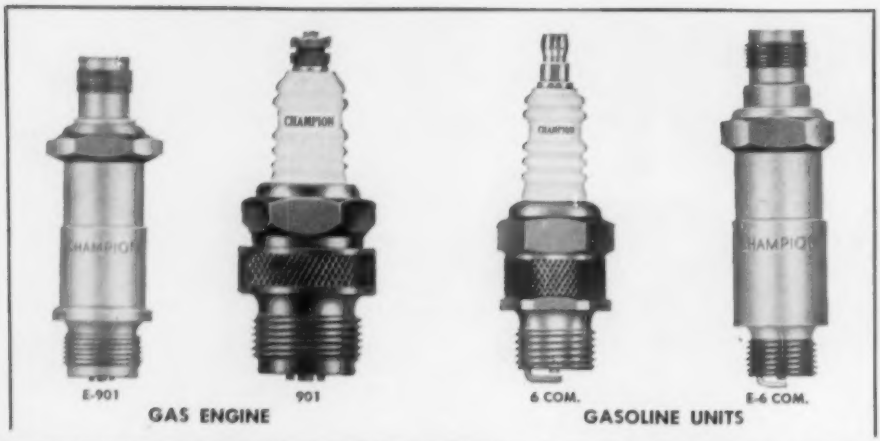
Rust-Oleum is *exclusive,* incorporating a specially-processed fish oil base that penetrates rust to bare metal. It dries right, is free of objectionable odor, is ready-mixed and self-leveling. Specify genuine Rust-Oleum. Accept no substitutes. Many leading industrial oil field supply distributors carry complete stocks for your convenience.



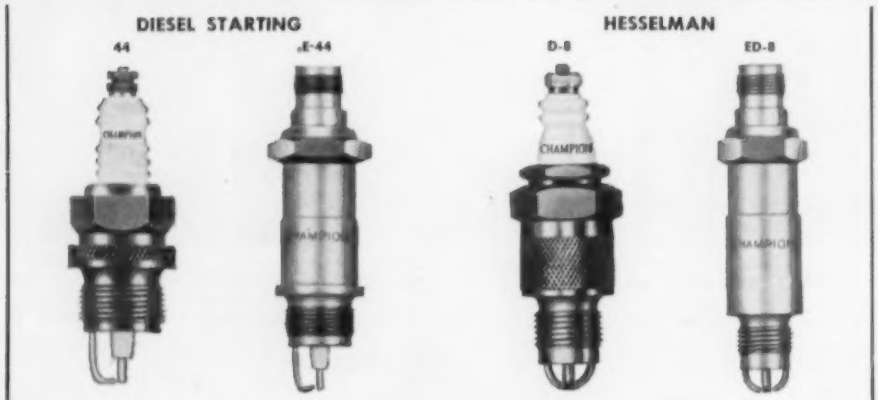
FOR FREE TEST SAMPLE—ATTACH TO YOUR LETTERHEAD AND MAIL TO: RUST-OLEUM CORPORATION 2542 OAKTON ST., EVANSTON, ILL.

Please Send Me a FREE TEST SAMPLE to Match the Following Color: (check sample desired)

- ☐ Test Sample of 769 Primer to be applied directly over rusted surface
- ☐ Test Sample of CATERPILLAR YELLOW
- ☐ Test Sample of NEW NATIONAL BLUE
- ☐ Test Sample of NEW UNIT RIG GRAY
- ☐ Test Sample of NEW EMSCO GREEN
- ☐ Test Sample of BETHLEHEM YELLOW
- ☐ Test Sample of WAUKESHA GRAY
- ☐ Test Sample of OIL WELL ORANGE
- ☐ Test Sample of OLD EMSCO GREEN
- ☐ Test Sample of READY-MIXED ALUMINUM
- ☐ Test Sample of HIGH GLOSS WHITE
- ☐ Test Sample of QUICK DRYING BLACK
- ☐ Nearest Source of Supply
- ☐ Complete Literature and Color Charts.



For better performance in every industrial and oil field engine specify dependable CHAMPION SPARK PLUGS!



BEST FOR ANY ENGINE

CHAMPION

SPARK PLUGS

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

ask the man from Layne

. . . he offers complete service . . . and undivided responsibility!

There can be no "buck passing" on any job Layne undertakes for Layne assumes complete and undivided responsibility for every phase of every job.

City officials—farmers—and captains of industry know that when it comes to water, it is smart to put all your eggs in one basket.

On any question that relates to water, first "ask the man from Layne." He is the water answer man and his services are free upon request.

LAYNE & BOWLER, INC.
General Offices
Memphis 8, Tennessee

Layne Associate Companies Throughout the World

water wells • vertical turbine pumps • water treatment

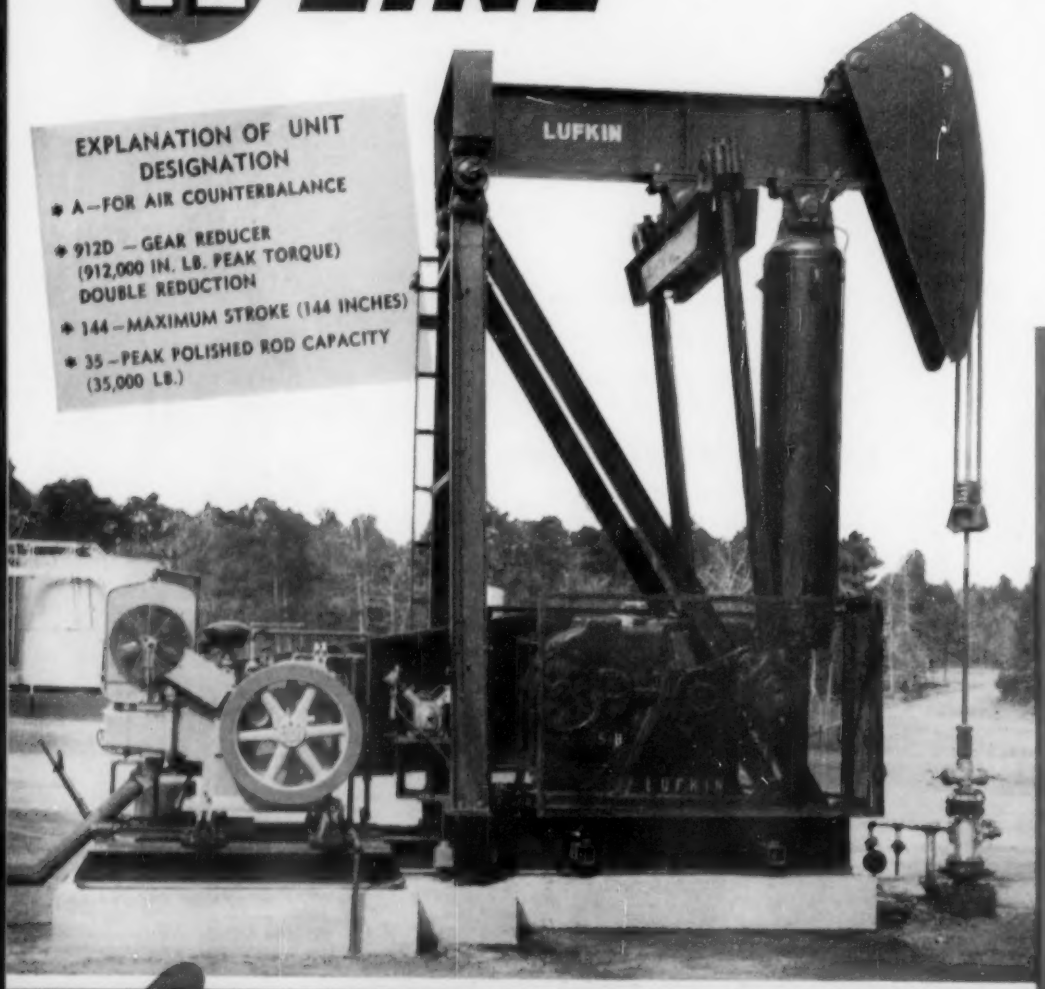
Instantaneous APPROVAL FROM THE FIELD

of the LUFKIN A LINE

The LUFKIN Air-Balanced Unit has been accepted as a member in good standing of the LUFKIN line of superior pumping equipment as indicated by the many repeat orders we are receiving from satisfied customers.

EXPLANATION OF UNIT DESIGNATION

- A—FOR AIR COUNTERBALANCE
- 912D — GEAR REDUCER (912,000 IN. LB. PEAK TORQUE) DOUBLE REDUCTION
- 144—MAXIMUM STROKE (144 INCHES)
- 35—PEAK POLISHED ROD CAPACITY (35,000 LB.)



AVAILABLE FOR QUICK DELIVERY IN THE FOLLOWING SIZES:

*A-912D-144-35
A-912D-120-35
A-912D-120-30
A-640DB-144-35
A-640DB-120-35
A-640DB-120-35
A-456DB-120-30
A-456DB-100-30
A-320D-100-27
A-320D-86-27
A-228D-86-23
A-228D-74-23
A-160D-74-20
A-160D-64-20
A-114DA-64-16
A-114DA-54-16
A-80DB-54-16

Lufkin **FOUNDRY & MACHINE COMPANY**
LUFKIN, TEXAS

Branch Sales and Service: Houston • Dallas • New York • Tulsa • Los Angeles • Seminole • Oklahoma City • Corpus Christi • Odessa Kilgore • Wichita Falls • Casper, Wyoming • Great Bend, Kansas • Ettingham, Illinois • Sterling, Colorado Lafayette, Louisiana • Bakersfield, California • El Dorado, Arkansas

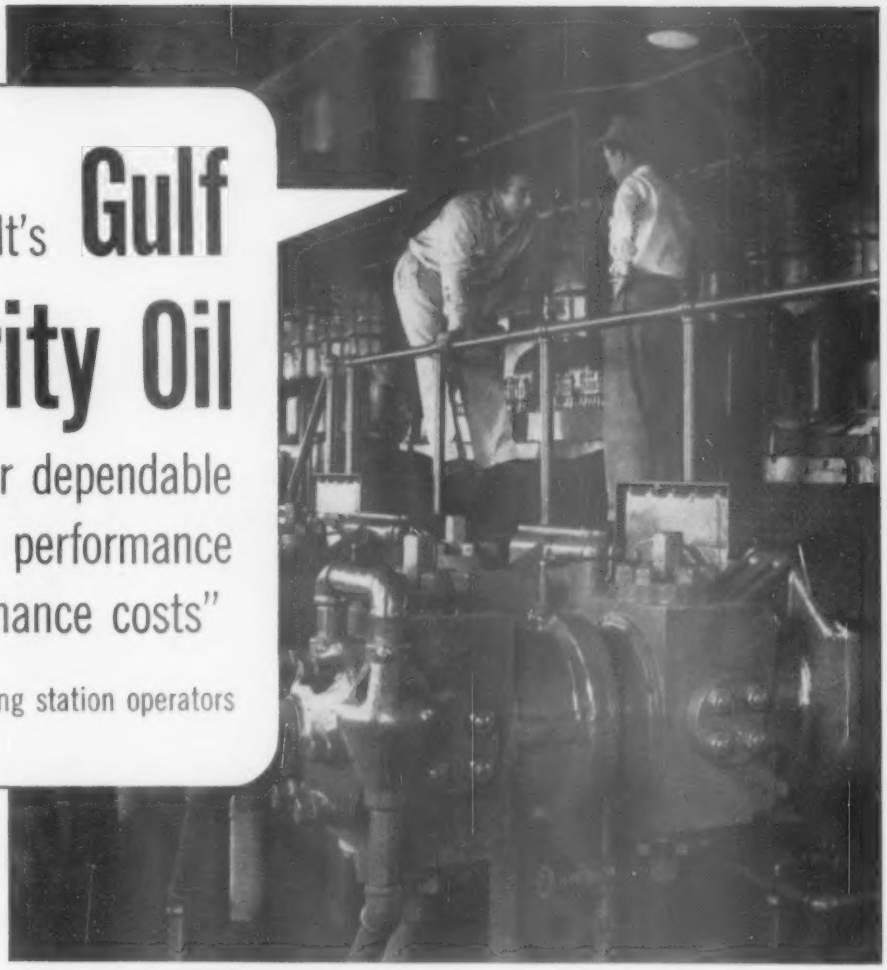
Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, EDMONTON, ALBERTA, CANADA

"It's **Gulf**

Security Oil

for dependable
gas compressor performance
and low maintenance costs"

say pumping station operators



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

You can depend on Gulf Security Oil to provide the proper lubrication that is so important to vital compressor units if operating troubles are to be prevented and maintenance costs kept low.

Gulf Security Oil has a record of outstanding performance in scores of gas transmission plants. After years of operation with this quality oil, the cylinders and piston rings of both the compressors and power assemblies show negligible wear. And few carbon deposits have formed on power cylinder ports and pistons.

If you are installing new compressor units, or feel that you're not getting the most effective lubrication possible for your present units, it will certainly pay you to try Gulf Security Oil. Contact your nearest Gulf Office and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company
1822 GULF BUILDING, PITTSBURGH 30, PENNSYLVANIA

GULF

The finest petroleum products for your every need

Going places with GAS?

...See a Mercantile Man!

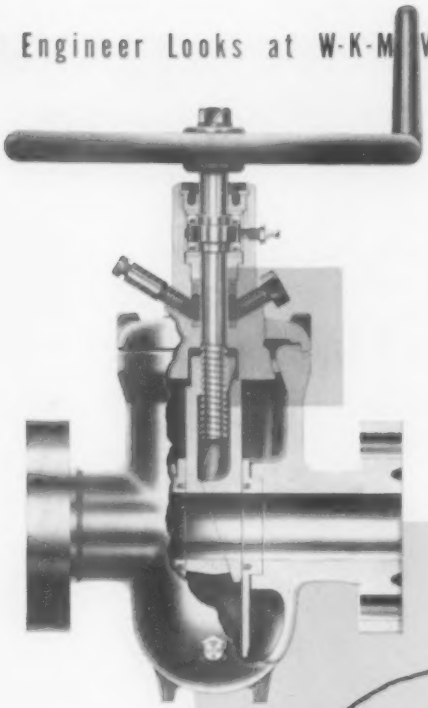
Natural gas is going places from the time it leaves the well. Whether it's from the field to giant pipelines, to metropolitan markets, or from fields to fractionation units which have made possible America's fast-growing petrochemical industry, a Mercantile Man can help you. Experienced specialists in our Oil and Gas Department work as a team in devising sound plans to finance gas operations. That may involve compiling and interpreting statistical data, or providing advice on field service. If your plans involve producing, transporting, or converting natural gas, be sure you have workable financing. A Mercantile Man can help you.

Mercantile National Bank

Dallas, Texas

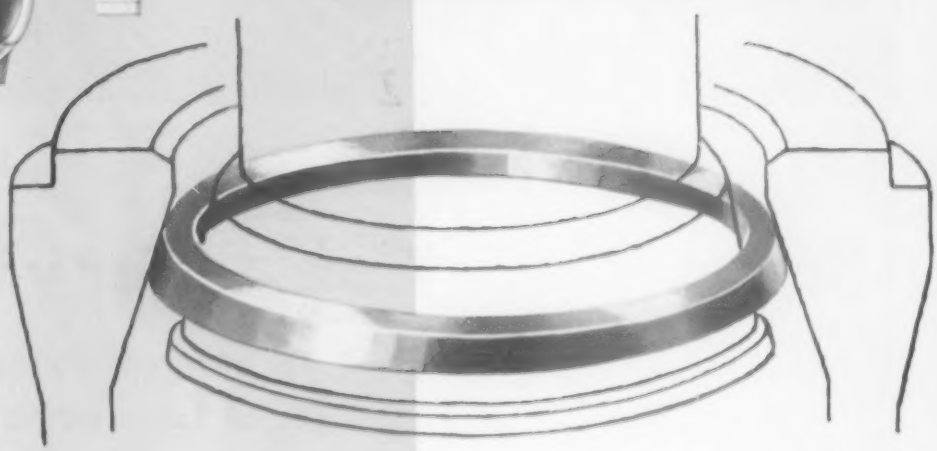
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

An Engineer Looks at W-K-M Valves . . .



W-K-M Bonnet Flex-Float Ring* Seals Tight Regardless of Pressure and Temperature Variations

* An Exclusive W-K-M Feature



Pressure changes, temperature changes and changes in stresses force the W-K-M Bonnet Flex-Float Seal Ring into closer engagement with its seat, thus always maintaining a tight bonnet seal.

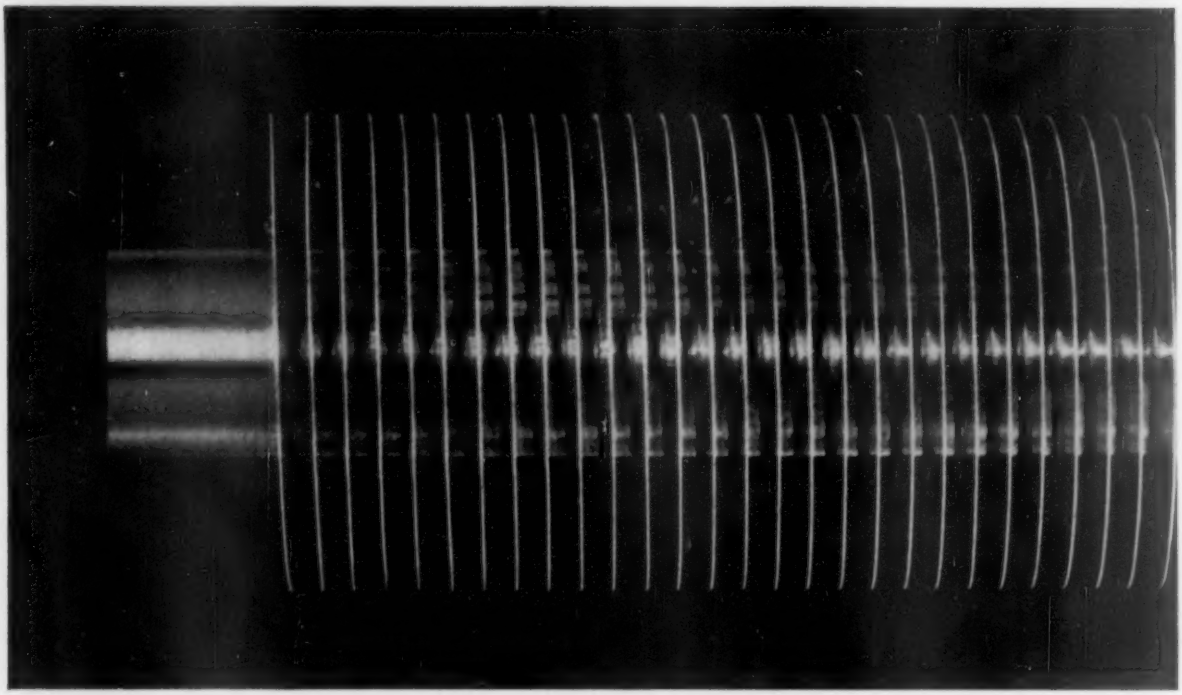
Conventional ring joints require excessively high stud and bolt tensions to deform the ring to the point where the residual seat load is above that required to make a fluid-tight seal. But line pressure and temperature variations can quickly lower this residual load and cause leakage. This is not possible with the W-K-M Flex-Float Seal Ring, whose seat load increases as the pressure and/or temperature goes up.

This type of ring has been used in W-K-M valve bonnets for 10 years.

For full information ask your W-K-M Sales Engineer.

W-K-M Manufacturing Company, Inc.
A subsidiary of ACF Industries Incorporated
P. O. Box 2117, Houston 1, Texas Los Angeles, California
Export Office: 45 Rockefeller Plaza, New York, N. Y.

W-K-M Valves



AEROFIN
Smooth-Fin Coils offer you

Greater Heat Transfer
per sq. ft. of face area

Lower Airway Resistance
—less power per c.f.m.

Aerofin smooth fins can be spaced as closely as 14 per inch with low air friction. Consequently, the heat-exchange capacity per square foot of face area is extremely high, and the use of high air velocities entirely practical. Tapered fin construction provides ample tube-contact surface so that the entire fin becomes effective transfer surface. Standardized encased units arranged for simple, quick, economical installation.

Write for Bulletin S-55

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

Interesting "Quickie" on IDECO SHORTY BLOCKS

The IDECO Shorty unitized with hook reduces over-all length by as much as 9 feet.

Automatic safety lock makes it impossible to open the hook under any load—even the weight of the swivel bail. When all weight is removed and the lock released, the hinged portion of the hook drops open in perfect position to guide the swivel bail into place.

Swiveling link and hook lock in any one of eight positions by means of a reach bar from the derrick floor.

Hydraulic shock absorber (patented) in spring-loaded hook provides smooth stops and guards against shock loading.

Equipped with perfectly balanced IDECO Fabriform sheaves, with hub, web and rim of alloy steel. Mounted on double row of Timken tapered bearings.

Hinged sheave guards open wide to permit fast reeving.

Shorty blocks can be had with clevis only if preferred. Clevis can be replaced at any time with unitized assembly, simply by removing the pins which hold the clevis.

'Phone your J & L store or write us at Tulsa for new bulletin on IDECO Shorty Blocks.

100 TON
160 TON
260 TON
400 TON

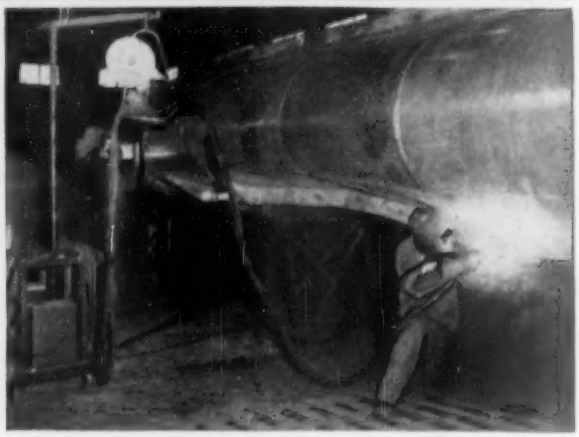
J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION—TULSA, OKLAHOMA
Serving The United States and Canada

PESA
PARTNERS IN PETROLEUM PROGRESS

Sigma Welded Aluminum Tanks

—WEIGH LESS
—CARRY MORE
—LAST LONGER



The problem of how to get bigger pay-loads in truck trailers and semi-trailers was solved by one manufacturer who converted to weight-saving aluminum and sigma welding . . . These giant semi-trailer tanks hold 7,950 gal.—700 gal. more than similar tanks made of steel.

The high quality of sigma welded aluminum has increased tank resistance to corrosion. Sigma welding has also eliminated expensive weld cleaning—welds need only a light grinding and they are finished. Each semi-trailer requires about 1,100 linear ft. of sound sigma welding. The new high-strength, ductile alloys used range in thickness from 3/32 to ½ inch.

Like many other products throughout industry, these trailers are being fabricated with new quality and efficiency using sigma welding.

Here are some features of sigma welding—

- Uses any d.c. or constant potential power supply. With c.p. voltage is held constant—welding operations are fast and more efficient.
- Makes smooth welds in joints of all types—on all commercially welded metals . . . joins metals up to ¼ in. thick in one pass.
- Sigma welding speeds exceed 100 in. per min. in many operations. Start saving now, call your local LINDE representative for more information—and ask for Form 7942 "Modern Methods of Joining Metals."

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

this little drip costs you money!

On a 10¢-per-gallon product, 6 CC of leakage per minute costs you about $90 per year in unnecessary product waste.

REPLACE PUMP PACKING WITH

BJ mechanical seals

Eliminate unnecessary stuffingbox leakage by installing a BJ Mechanical Seal. You not only realize important savings of pumped products but you also save on repacking and downtime losses. A BJ Mechanical Seal also prevents contamination of the pumped liquid ... protects against volatile and corrosive liquid hazards.

BJ MAKES A COMPLETE LINE OF MECHANICAL SEALS...

BJ makes reliable high-precision seals in material and construction combinations to answer almost any pressure, temperature and liquid requirements. This means that BJ can provide the *one best seal* for each specific pumping need. Ask your nearest BJ sales engineer to show you how Mechanical Seals can save you money. Or you can obtain further information by writing for BJ Bulletin No. 54-1-10,000.

BJ
SINCE 1872

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PUMP DIVISION

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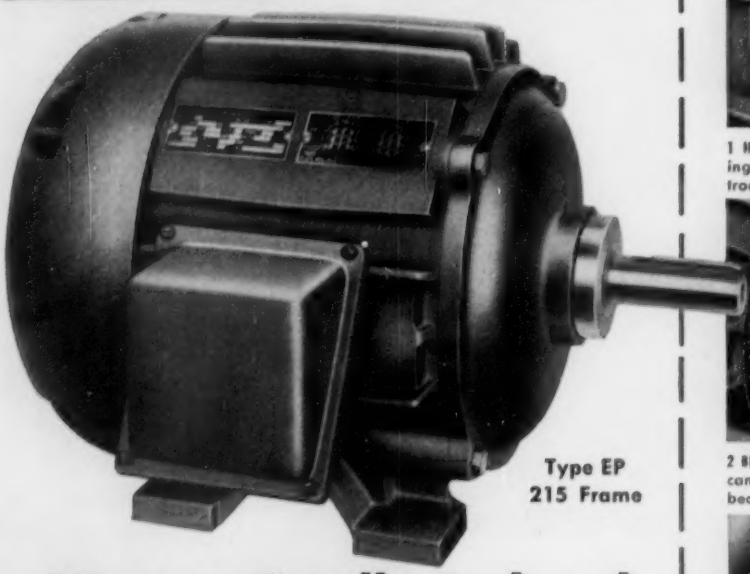
Sales Offices in Principal Cities

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

New NEMA Frames
Standard and Explosion-proof



Type EP
215 Frame

Wagner Totally-Enclosed Fan-Cooled Motors

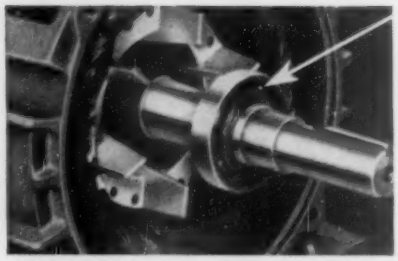
cut maintenance time and costs

Check the features of the new *Wagner Type EP Totally Enclosed Motor.* They spell the difference between needless expenditures in maintenance time and costs . . . and a definite savings in motor upkeep and repairs. You'll find that for general industrial use where dust, dirt, filings, abrasives, steel chips or moisture are present, the Wagner Type EP Motor gives steady, troublefree performance and longer service life.

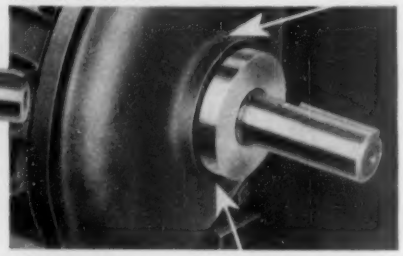
Wagner Type JP Explosion-Proof Motor . . . has the same quality construction as the Type EP — plus added features which make it completely safe to operate where explosive dust, gases or vapors are present.

Both Type EP and JP Wagner motors are available in ratings up to 250 horsepower. For complete information, just call the nearest of our 32 branch offices, or write for Bulletin MU-203.

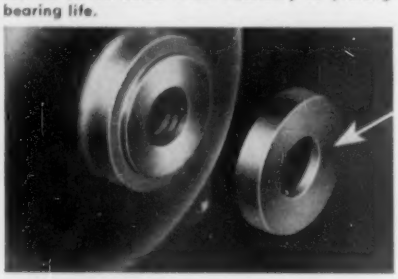
Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo.



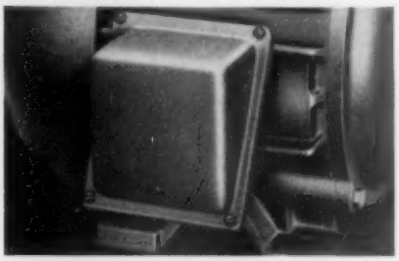
1 HEAVY-DUTY BALL BEARINGS—Highest quality bearings of more than ample capacity provide long, troublefree service.



2 BEARINGS CAN BE RE-LUBRICATED—Wagner motors can be re-lubricated when necessary to prolong bearing life.



3 BEARINGS STAY CLEAN—Both ends of these motors are equipped with running shaft seals, a machined collar mounted on the motor shaft.



4 EASY TO CONNECT—Large diagonally-split conduit box provides ample room for making connections. Leads are permanently identified.

5 NO GREASE LOSS—Bearing housings have effective seals to prevent escape of grease.

6 RIBBED FRAME—Ribs on the corrosion-resistant cast iron frames add mechanical strength and increase the surface area for more efficient cooling.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M55-10

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

"Like getting the hole calipered FREE!"

...as a driller said recently.

Here's why no other caliper can match the

Johnston Hydraulic HOLE CALIPER

Whatever the hole condition, you can be sure of getting a complete picture with the Johnston Hydraulic Caliper!

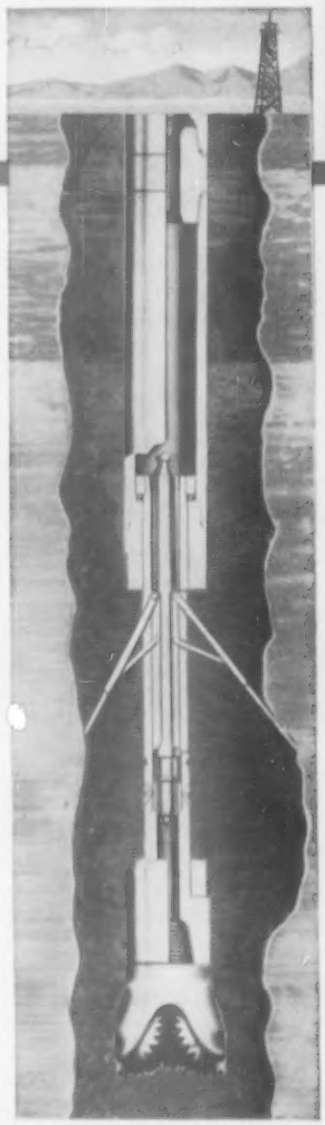
Saves time! No need to stop and rig up wire line. No delay or difficulty in crooked or directionally drilled holes.

Saves money! The *only* hole caliper that can often pay the cost of calipering in savings in rig time. The Johnston Hydraulic Hole Caliper is dropped into the drill pipe just before pipe is removed. Measures and records hole diameter as pipe is pulled from hole. Pipe may be rotated out in normal manner.

Accurate! Records continuous diameter of hole, bottom to top, either at detail speed or normal charting speed. Each measuring arm functions independently assuring the accurate measurement of irregular shaped hole.

Measures from the bottom! With the Johnston Hydraulic Hole Caliper, you can always be sure of starting to measure at the bottom every time.

When you get so many more advantages by using the Johnston Hydraulic Hole Caliper, why ever use less?



The Johnston Hydraulic Caliper provides accurate information on hole diameter from bottom to top. Information you can use with confidence.

WRITE OR CALL FOR DESCRIPTIVE FOLDER

JOHNSTON TESTERS

first in drill stem testing

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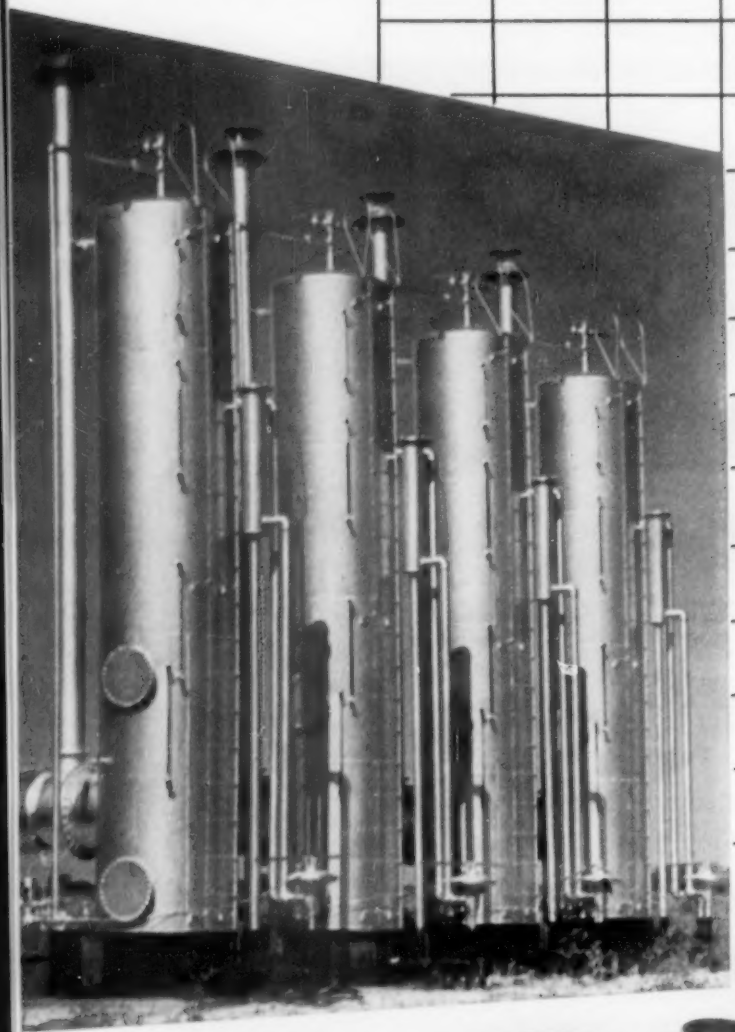


There's MORE for your money in PARKERSBURG Emulsion Treaters

• Parkersburg Emulsion Treaters are the deluxe type of the treater field. Like new model cars, they have all the "extras," but without the extra cost. They cost no more than comparative standard treaters of the same size.

With all of the extras of a deluxe model you get better emulsion and free water separation; more effective emulsion breakdown; more specific separation of emulsion into clean oil and water; greater maintenance of high gravity oil through conservation of lighter fractions.

Summing up, Parkersburg Treaters will handle a wider variety of treating problems with least auxiliary equipment. Size for size they will handle more fluid, do more heating, perform more efficiently and give you more for your money than you can get elsewhere.

Ask your Parkersburg Representative to outline all of the features of Parkersburg Emulsion Treaters.

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

PESA

3345 WINTHROP AVE.
FORT WORTH, TEXAS

NO. 5503

SHELL REPORTS

A PICTURE ROUNDUP OF SOME ACTIVITIES THAT MADE NEWS OUTSIDE THE PETROLEUM WORLD

PIPE RIDE. Poling for submerged roots, this oil "gondolier" rides one-mile sections of the Norco-to-Baton Rouge pipeline through 11 miles of mushy cypress swamp. Pipe lengths are welded on broad wooden islands in the swamp and then floated forward slowly through dense, snake-infested undergrowth. Now "on-stream," the new Louisiana line will help Shell speed more products to market for everybody.

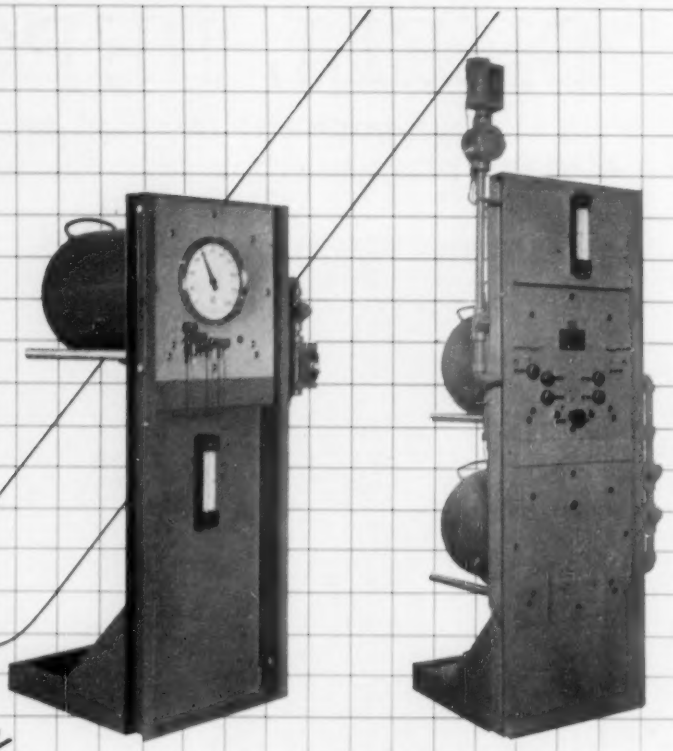
SQUEEZE PLAY. This new lift truck developed by Shell grabs loads by the sides instead of lifting from below. With selected control pressures, it totes drums, cartons, rolls, bales and barrels – safely and quickly. This new technique reduces the cost of frequent package transfer, and helps Shell keep the cost of petroleum products down.

FULL HOUSE. Since 1939, forty-one foster children have lived and laughed and been loved in the home of "Mom" and "Pop" Craig. Because their own four daughters were at college or faraway jobs, the Allen Craigs opened their home to a parade of less fortunate children. Today Al is retired after 28 years with Shell. But the Craigs are still on active duty as foster parents in their home at Meiners Oaks, California—and loving every minute of it. Their 25 years of kindness in the troubled lives of 41 young people makes Shell proud of its long association with two wonderful people—"Mom" and "Pop" Craig.

throughput up

quality up

costs down



process refractometer

(Type 38-201)

Monitors or automatically controls a process stream by *continuously* comparing its refractive index (the measure of the velocity of light through the test fluid compared to its velocity through a vacuum) with the index of a sample of *desired* composition. SEND FOR BULLETIN CEC 1839-X15.

infrared analyzer

(Type 38-101)

Handles up to five streams at a rate of 5 analyses per hour, i.e., 12-minute cycle. Increases fractionator capacity by minimizing fluctuations and holding product composition steady. Eliminates the time lag inherent in sampling and batch analysis. SEND FOR BULLETIN CEC 1840-X15.

Here are the first "Consolidated-Phillips" *continuous* process analyzers . . . units which provide analytical data while it's valid, *before* variables have changed. With these two instruments on stream, product quality and production go up . . . costs go down. You can install and maintain them for less, on an hourly basis, than a laboratory technician's salary. Both instruments are completely explosion- and weather-proof.

Consolidated-Phillips process analyzers have been proving their ability . . . and dependability . . . under actual plant conditions for several years. Originally designed and formerly manufactured by Phillips Petroleum Company, they are now backed by Consolidated Engineering's nationwide service organization . . . assurance of interruption-free operation for years to come at the pace demanded by modern refinery practice.

Whether your process instrumentation needs are for a single unit or a complete analysis-and-control system, you'll find it will pay to talk to a CEC Field Engineer. Write us today.

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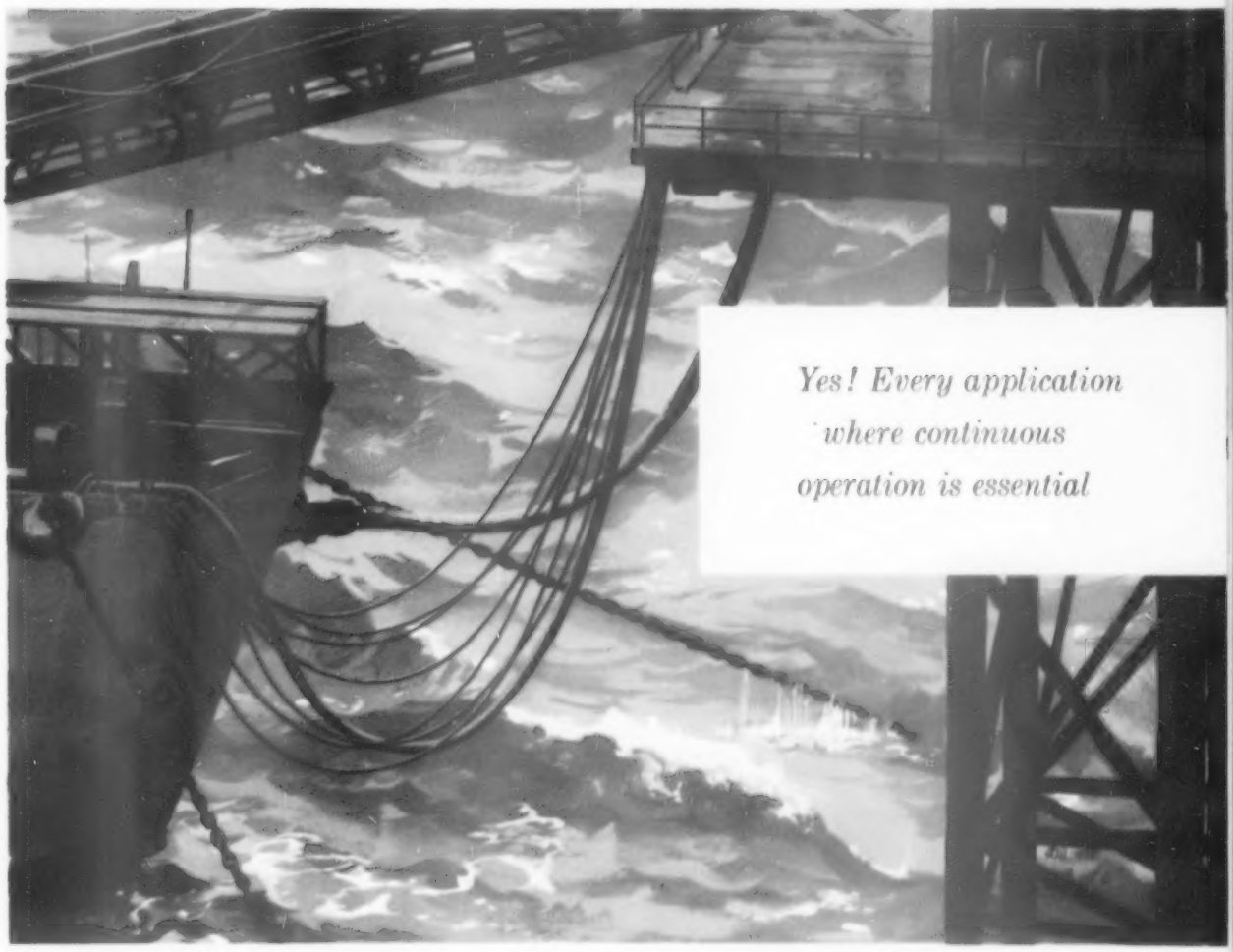
of New York Belting & Packing Company



Yes! Every application where continuous operation is essential

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THE CONTINENTAL SUPPLY COMPANY

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Representatives in All Principal Oil Fields of the World

NEW YORK BELTING & PACKING CO. • Founded 1846

These NYB&P highest quality hose are available through Continental's convenient time-saving service:

High Pressure Mud Hose . . . Utility Hose
Mud Return Hose . . . Fresh Water Hose
Salt Water Hose . . . Compressed Air Hose
Potable Water Hose . . . Fuel Hose

Right Lay? *6x19?* *Left Lay?*

6x32? *Yellow Strand?* *Seales?*

Non-Rotating? *Tubing Line?*

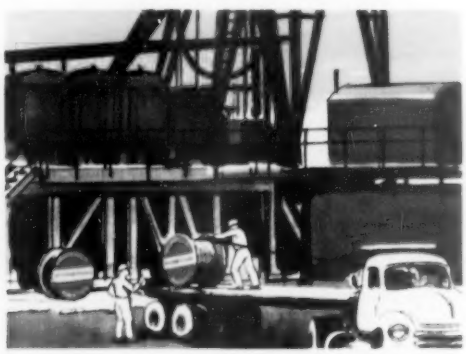
Tubing Line? *Rotary Line?* *1¾" Dia?*

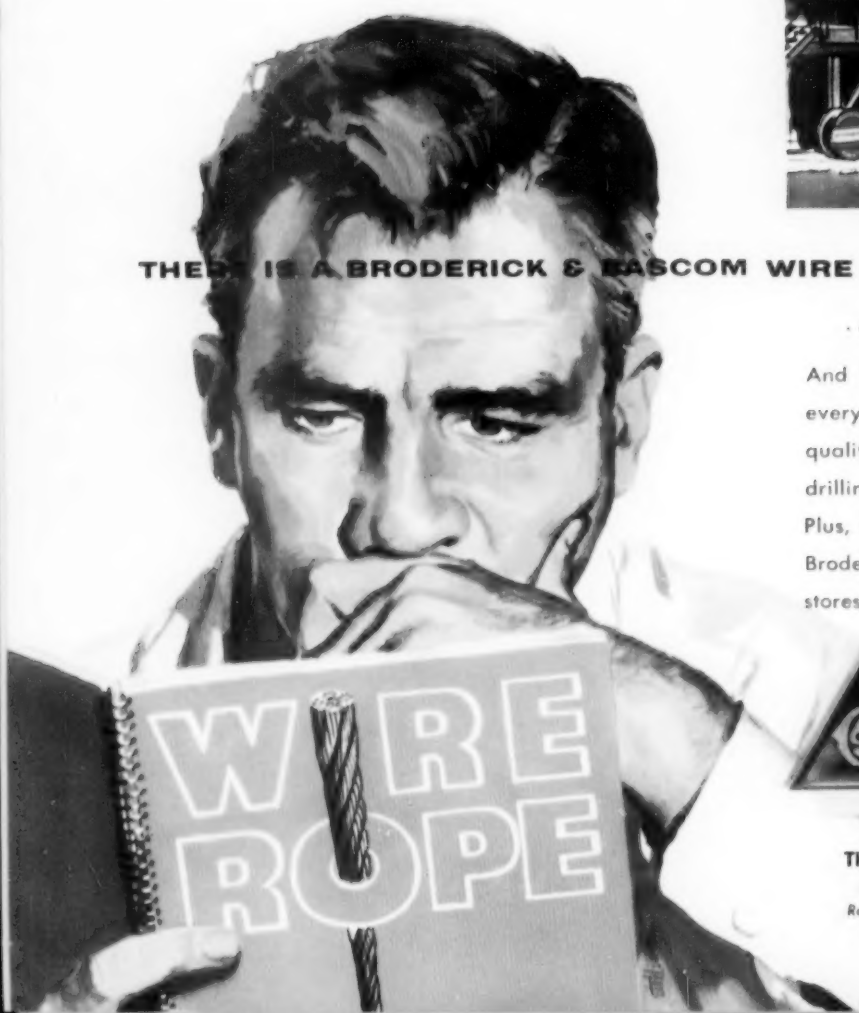
Power Line?

Plow Steel? *1¼" Dia?*

Flexset?

Galvanized? *Hemp Center?*





THERE IS A BRODERICK & BASCOM WIRE ROPE FOR EVERY JOB

. . . whatever the requirement!

And there is unsurpassed quality built into every inch of Broderick & Bascom line . . . quality that assures longer life under toughest drilling conditions.

Plus, of course, the ready availability of the Broderick & Bascom line at all Continental stores located throughout the Oil Country.

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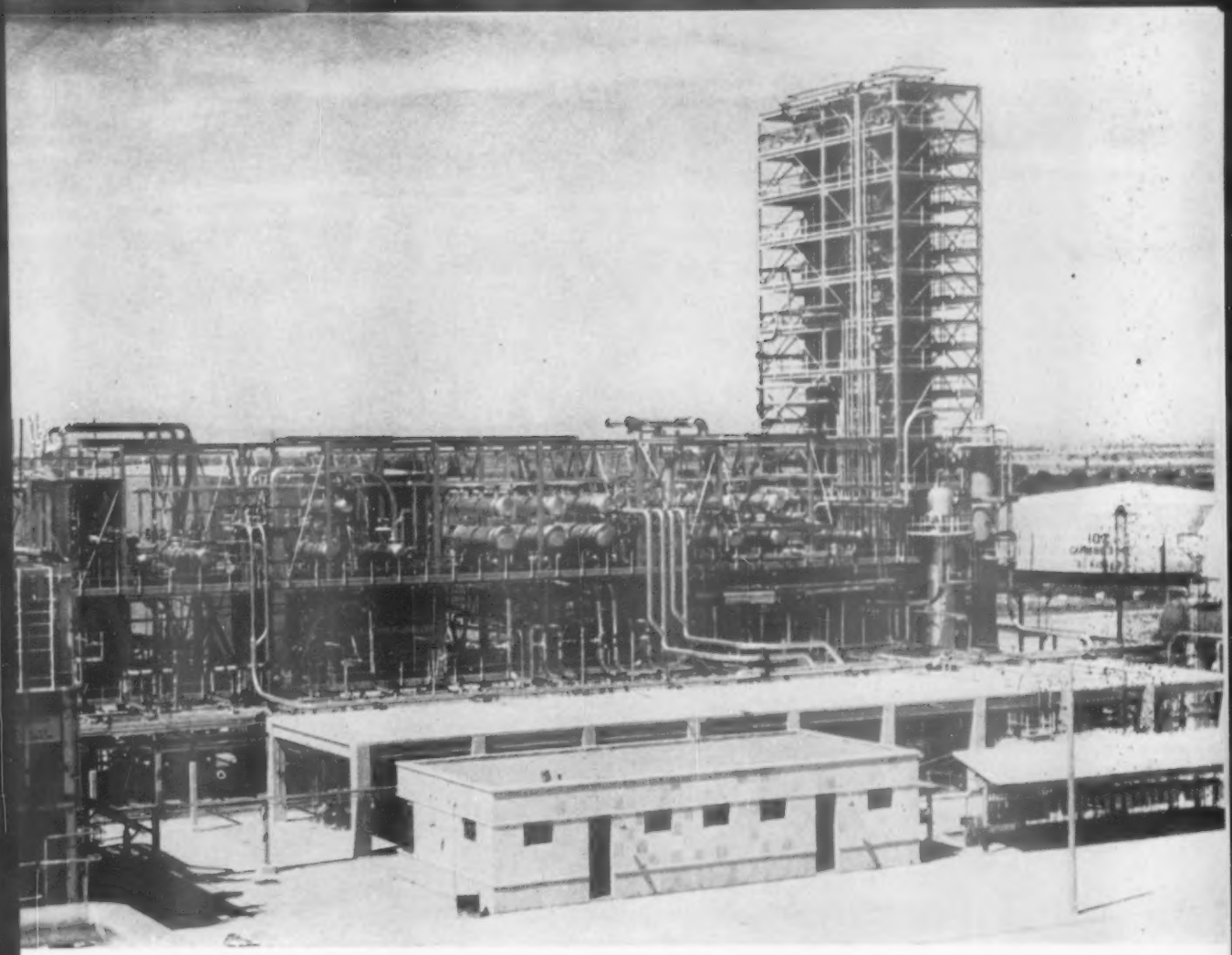

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McKEE ASSURES YOU SOUND ENGINEERING OF EVERY DETAIL OF YOUR NEW PROJECT

● McKee brings to your project a fifty-year background of specialized experience in the design and construction of some of the most complex types of production facilities in use today. But, equally important to you, is the high *quality* of McKee engineering—the meticulous care given to every detail—from studies for selection of the site to completion of the plant ready for operation.

It's this high *quality* of painstaking engineering by McKee that results not only in correct design and efficient layout, but in reduced construction man-hours and most advantageous use of materials. That's why top men in the world-wide industries we serve will tell you "*McKee is the best name you can get*" on the engineering of your new plant.

50th ANNIVERSARY

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Rated Capacity
10,000 feet with 4½"
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Wilson

The FIRST NAME in DRILLING RIGS!

WILSON MANUFACTURING CO., Inc.

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EASY COUPLING–EASY UNCOUPLING

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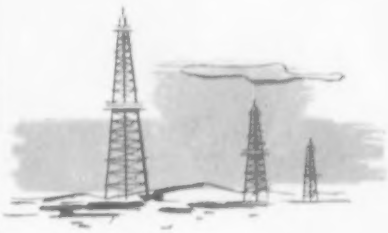


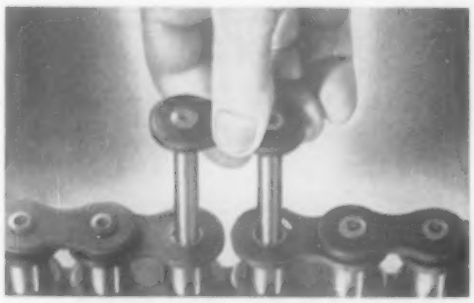
WITH REX OIL

FIELD ROLLER CHAINS

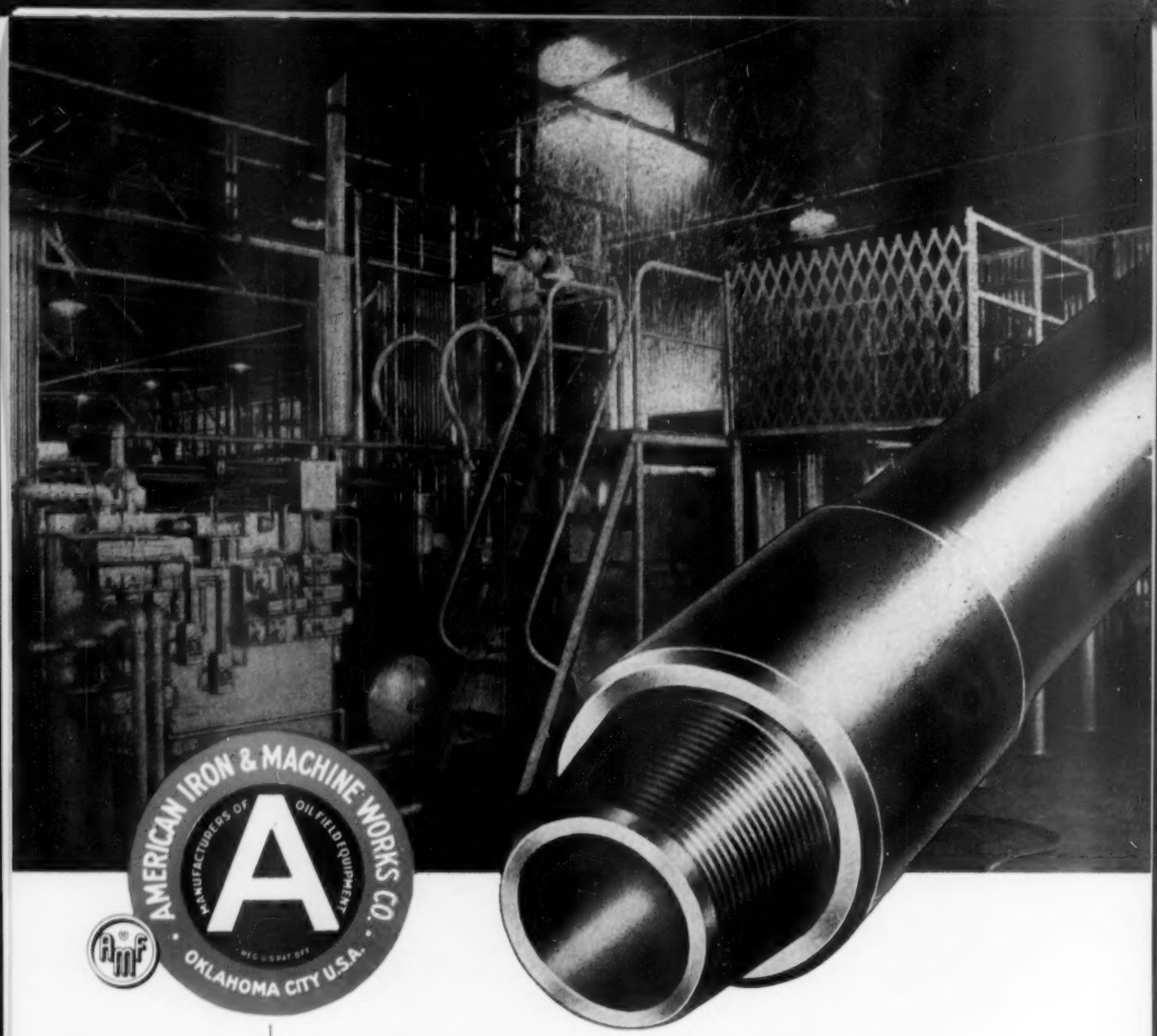
Here's the oil field roller chain you've always wanted...easy to take apart...easy to couple ...but with a service life equal to, or better than, other roller chain.

To take this chain apart, you need only drive the pins the thickness of a single side plate. Then, you can pull the pins the rest of the way through the chain by hand...or by light tapping. It's just as easy to couple together.

These desirable features are now possible without sacrificing the long-life features of heavy press fit chain. Investigate this chain for your needs, today. See your supply store or write for your copy of Bulletin No. 55-3. Chain Belt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wisconsin. Oil Field Offices: Dallas, Houston, Midland, Los Angeles, New York, Tulsa. Oil Field Warehouses: Dallas, Houston, Los Angeles.



CHAIN BELT COMPANY



Here's quality IN A FLASH . . . completing American Iron's controlled manufacturing processes, from the rough forging of tool joints through the accurate machining of bore, taper and threads.

You can confidently specify . . . and put your trust in

AMERICAN IRON *Flash Welded*

TOOL JOINTS

. . . product of modern technology, applied with strict conformity to American Iron's high-quality standards!

AMERICAN IRON & MACHINE WORKS COMPANY, INC.

Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY, New York

The SAFETY ENGINEER . . . .

. . . *his specialty* ACCIDENT PREVENTION

Every day more employers are taking advantage of the specialized services of trained TEIA Safety Engineers . . . to help promote safe job practices . . . to help boost employee morale . . . to reduce the number and severity of accidents . . . and thereby lower their Workmen's Compensation costs.

The Safety Engineer is an integral part of the TEIA SERVICE TEAM. Let him help you with your accident prevention program . . . and help you reduce insurance costs.

Millions of Dollars saved policyholders by Texas' largest writer of Workmen's Compensation.

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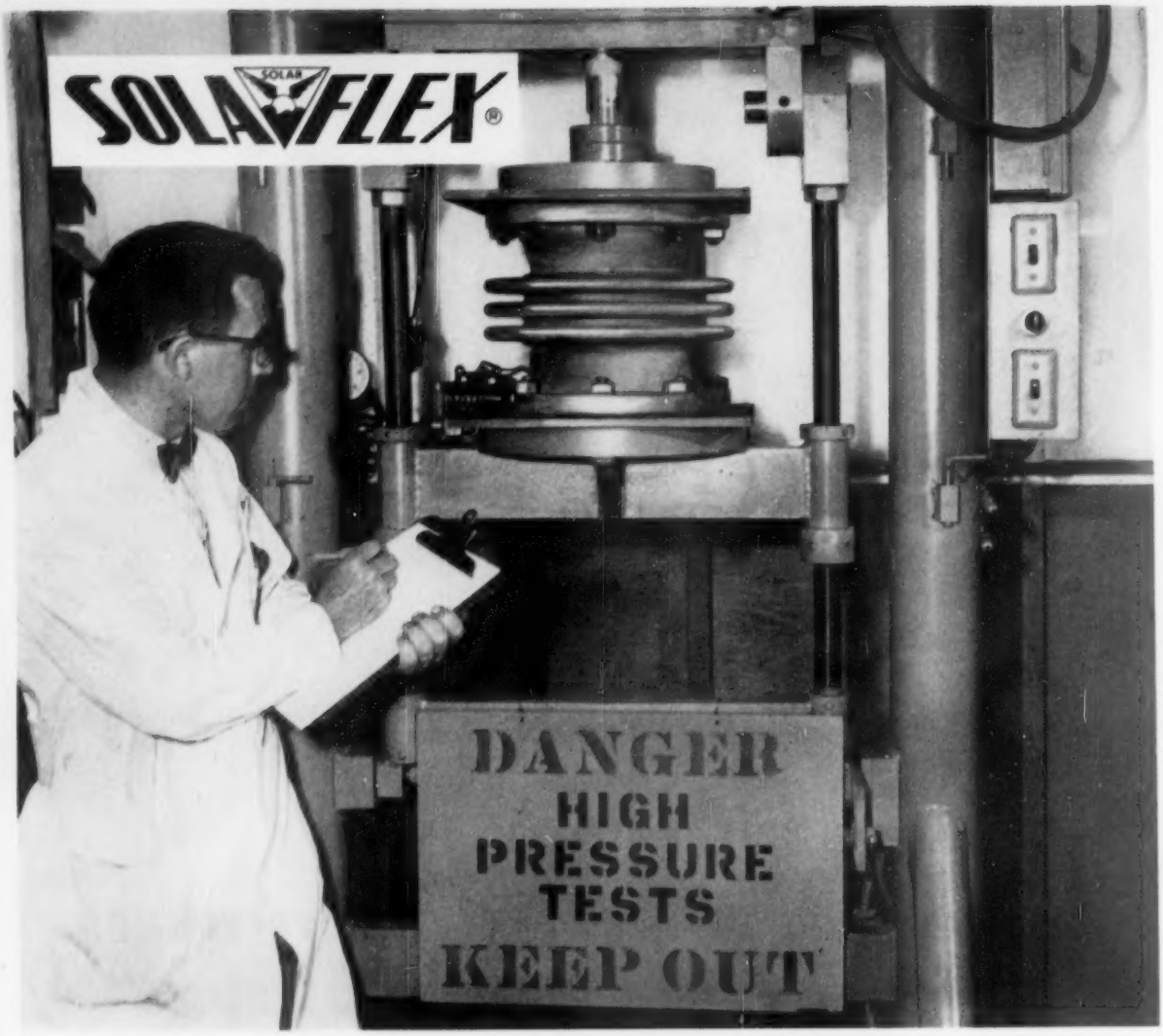
TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE - DALLAS, TEXAS



Solar's research program creates better expansion joints

SOLA-FLEX BELLOWS are constantly being improved – through new and better designs and more efficient fabricating techniques. These result from a research program ranging from basic studies through complete design and development engineering work. Users of the Sola-Flex line receive the benefits of these improvements.

Solar builds both convoluted (left) and U-span joints in all sizes, as well as special designs.

The photo above shows a Sola-Flex joint undergoing a cycling test. It is an 8-inch pipe size joint containing three U-spans, designed for 150 lb. service (225 psi test). The cycling tests demonstrated that the design had a fatigue life of more than 50,000 cycles.

Solar builds expansion joints for every type of service. Sola-Flex joints are rugged and economical. Write today for a complete Sola-Flex catalog; or ask for help with your piping problems involving extreme pressures and temperatures.

SOLAR
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INFORMATION: *Write Solar Aircraft Co. Department B-64, San Diego 12, California*

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Jac LeGoff asks:

WHAT IS YOUR MOST IMPORTANT ACTIVITY OUTSIDE OF YOUR JOB?

JAC LeGOFF, Well-known television newscaster, WJBK-TV, Detroit

FREDDIE M. GARTER,
Standard Oil Plant Cashier, Grand Rapids, Michigan:

"That's a hard question to answer, but if I have to select *one* outside activity as the most important, I think it would have to be my church work. I have been president of our Sunday School and now am serving as church treasurer. It has been a personally rewarding experience to be helpful in both a material and spiritual way. But there are two other outside activities in which I am very much interested—Scouting and PTA. I am the Scoutmaster of Troop 272 and am treasurer of the Godfrey School PTA."

MYRON E. JOLIDON,
Standard Oil Division Industrial Relations Manager, Milwaukee, Wisconsin:

"Traffic safety has been a pet project of mine for a long time. Safety should be everyone's business, and I realized this more than ever when I had the privilege of serving as president of the Wisconsin Council of Safety and as chairman of the Foremen's Safety School of the Milwaukee Association of Commerce. I've spent 30 years in safety promotional work as a career, so my outside activity in behalf of traffic safety has been a little like a postman's holiday."

DEAN H. HULL,
Standard Oil dealer, Springfield, Colorado:

"As a business man in a small community, I feel a special responsibility about good government in our town. There are a lot of privileges that go with citizenship, but for each one there is a balancing duty. Right now I am chairman of our City Council and in charge of the Streets Department and Electrical Department. I am also a member of the City Board on housing projects. Another important activity is the Student-Business Exchange Program, which helps local high school students get acquainted with business problems."

LEE WILSON, Electrician,
Standard Oil Refinery, Sugar Creek, Missouri:

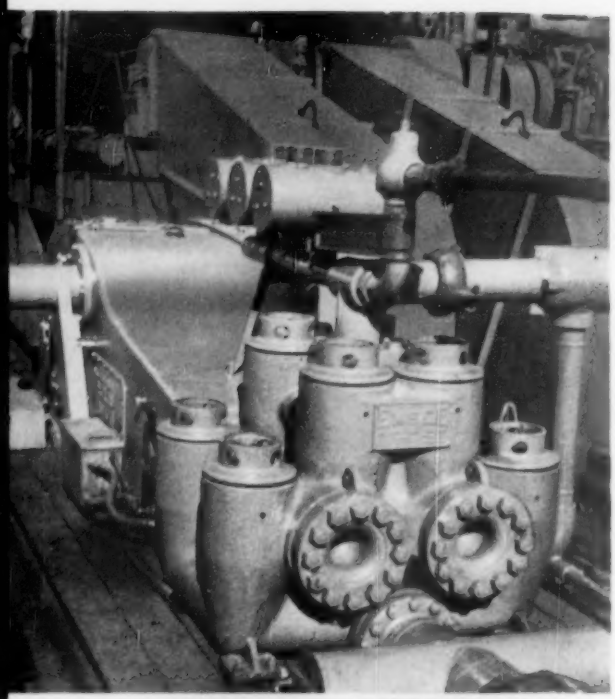
"I'm sold on Scouting, and for the past eleven years I have devoted most of my spare time to Boy Scout work. I am Scoutmaster of Troop 204, Independence, Missouri, and it's really rewarding to me to work with a boy who is making the hard climb up what we call 'the Eagle Trail.' You've heard that good Scouts become good citizens, and I know it's true. There's a special reward for Scoutmasters in watching their boys grow up and have a head start toward happy and successful adult lives. I am proud to be a part of this organization and to have two sons who are Boy Scouts."

Good citizenship on the part of a man or a company does not occur accidentally. It grows out of the constant practice of "The Golden Rule". Standard Oil is proud that many thousands of its employees and dealers find time to do just as good a job for their communities as they do for us.

STANDARD OIL COMPANY (INDIANA)

STANDARD

NEW EMSCO D-700



power-packed for jet drilling needs

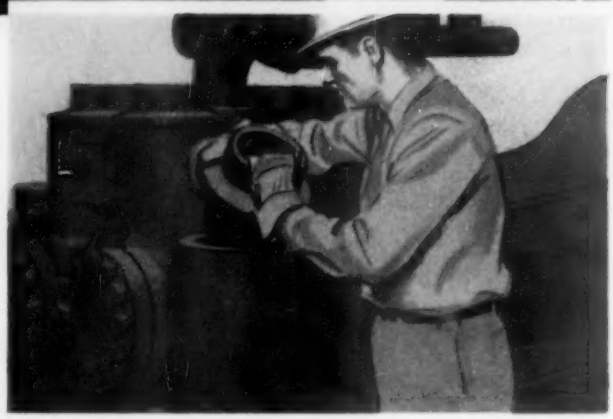
Emsco's powerful D-700 provides the extra punch needed for jet bit, big hole and deep drilling.

Strong and dependable, the D-700 maintains high pressures and volumes. And it's lightweight for its horsepower rating, too . . . provides more horsepower per pound than any other pump on the market.

Fabriform construction of the power end utilizes steel plates and shapes in place of bulky, heavy iron castings. This permits easier, more economical transportation and rigging up.

Operation and maintenance is simple and easy. There are no adjustments to be made . . . no greasing to be done . . . lubrication is completely automatic. Exclusive exposed liners enable you to detect and correct liner packing leakage before damage is done.

There's an Emsco slush pump to meet every pumping need. Call your Emsco representative for complete details.



SCREW TYPE VALVE-POT COVERS. Distinctive one-piece threaded valve-pot covers provide quick and easy access to valves . . . reduce bulk and weight.

EMSCO

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General Sales Offices: Dallas, Texas

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E-203-55

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Ask Your Representative About Sovabead

Process Products

MOBIL

Process Products

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They Say—

Flow of Imports Defended

"Recently legislation has been proposed to limit imports substantially . . . Strong positions have also been taken to the effect that unlimited importation is to be desired. The whole problem is too complex to be settled arbitrarily . . .

"We must have adequate supplies within our borders for a long time to come, bearing in mind that the United States uses its petroleum reserves at several times the rate of other areas . . .

"An immediate conclusion that could be drawn . . . that the national interest might be served best by maximum substitution of foreign oil. However, that deduction must be modified by considerations peculiar to the oil industry . . .

"Arguments for unrealistic curtailment of imports also disregard the very real danger to our long-term security and economic growth that such legislation . . . can cause abroad . . .

"To promote the best interests of the U. S., what should be sought are considerations favoring conservation of domestic resources, consistent with maintaining the basic incentives for the continued development of a strong domestic industry . . .

"It is the opinion of the management of this company that the balance existing today reasonably meets these requirements and that such a balance can and should be maintained by voluntary action. Profits are lower than they would be if all wells were operated wide open, but domestic production nevertheless remains at a point where incentive, as balanced against the investment required, is adequate to maintain the vigorous domestic industry so essential to the country.

"Substantial change in the rate of imports in either direction from the present percentage of total consumption would, while advantageous to one segment of the industry or the other, upset a balance that provides the closest reasonable approach to the over-all national interest . . ."

R. G. Follis, chairman, Standard Oil Co. of California, in an editorial in the July issue of The Bulletin, the company magazine.

Interested in "Reodorants"

Sir:

We have a considerable interest in Mr. Resen's article entitled "Industrial Reodorants Can End Refinery Odor

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Problems," which paper was presented by C. H. Nichols, Rhodia, Inc., New York (The Oil and Gas Journal, June 6, page 84).

It would be greatly appreciated if you would cable us at our expense the correct address of Mr. Nichols if in your opinion you feel he might be helpful to our situation. . . .

Jefferson W. Mitchell
General Manager
Daura Refinery
Baghdad, Iraq

Editor's note: The cable was sent. For other interested readers, Mr. Nichols' address is Rhodia, Inc., 230 Park Avenue, New York 17.

Spending Breakdown Sought

Dear Sir:

We are seeking a source of information concerning the distribution of income, of various oil-producing companies, to research, exploration (seismograph, gravity meter, etc.), and to other various major divisions of the company. Of special interest to us would be the knowledge of the average number of petroleum engineers assigned to some unit number on barrels in reserve or in daily production . . .

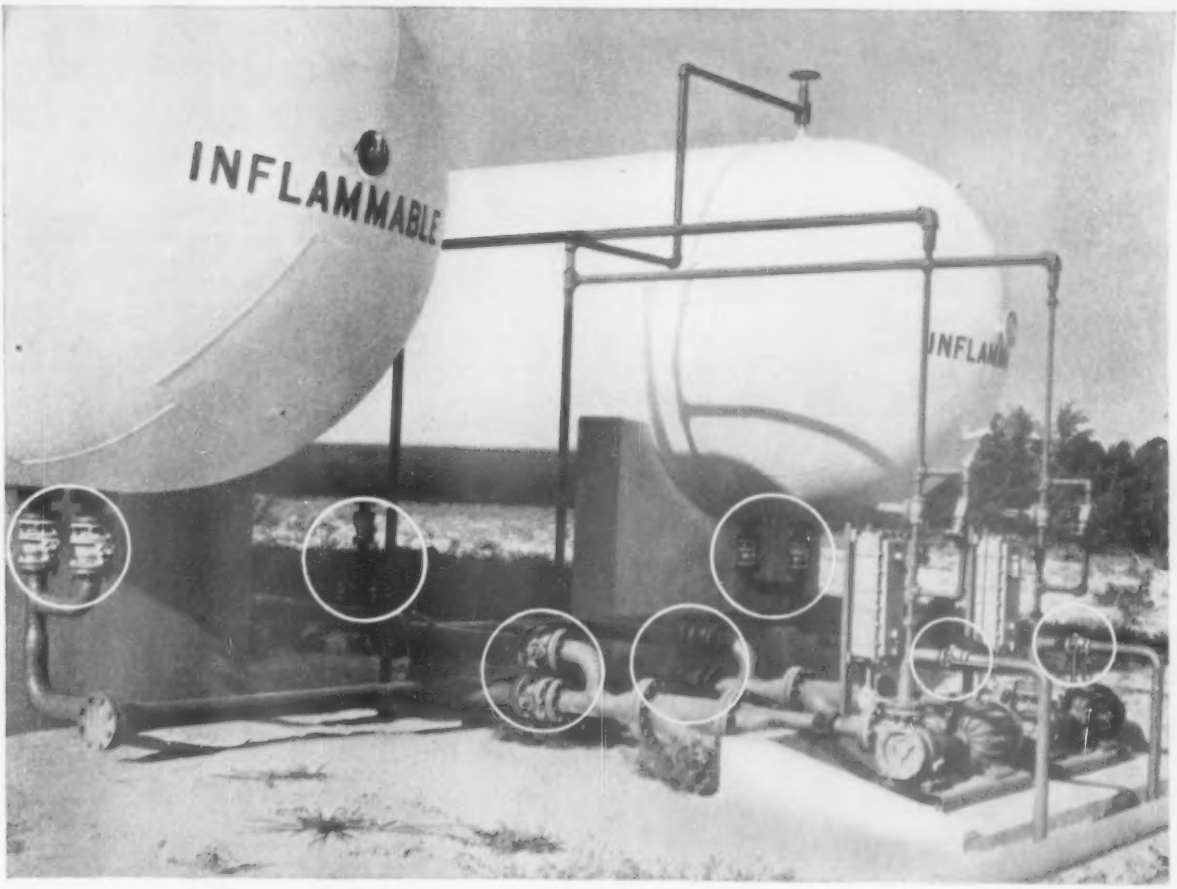
Herman Brown & George R. Brown
J. E. Teddlie, Jr.
Division Superintendent
Herman Brown and
George R. Brown
Oklahoma City.

Editor's Note: We think we have some of the financial breakdown information you are seeking. In the Journal of July 25, 1955, look on page 176, and in the January 31, 1955, Journal look on pages 166-167.

Gulf Accepts Imports Policy

"Operations of all departments were above any previous first 6 months period. On a world-wide basis, the company's net crude-oil production was 21 per cent greater than in the first half of 1954, crude processed at Gulf's refineries was higher by 10 per cent, while the volume of refined products sold showed an increase of 6 per cent. In the United States, the company's crude-oil production increased as a result of greater productive capacity.

"The demand for petroleum in the United States thus far this year has exceeded earlier expectations. Total domestic crude-oil production increased 5 per cent over the corresponding period a year ago. Oil importers generally are being guided by the recommendations of the President's Advisory Committee on Energy Supplies and Resources Policy. Gulf has accepted the



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City .....

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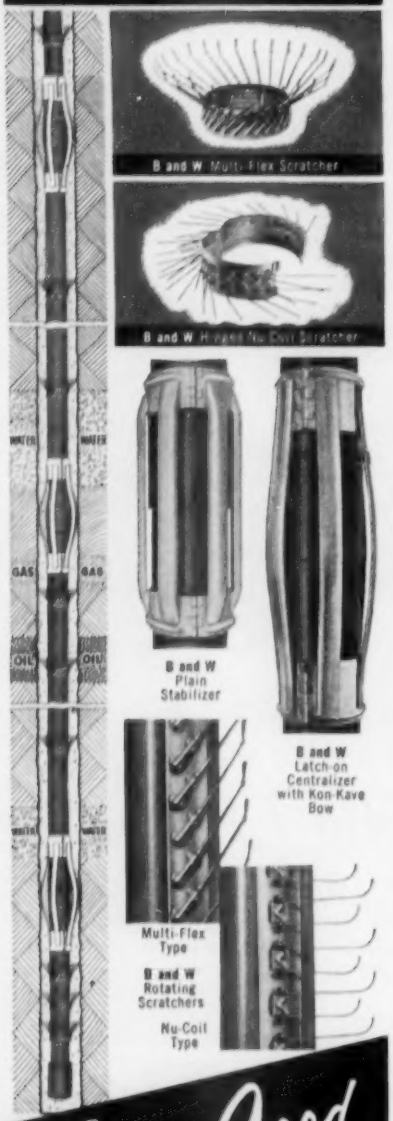
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committee's suggestion that the industry's imports should not exceed significantly the same ratios which they bore to domestic crude oil production in 1954, and we expect our imports for the year 1955 will conform to that policy."

W. K. Whiteford, president, and S. A. Swensrud, chairman of Gulf Oil Corp., in a 6 months' report to stockholders.

CALENDAR

SEPTEMBER

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

14-17 American Association of Petroleum Geologists Western Canada regional meeting, and Alberta Society of Petroleum Geologists 5th annual field conference, Jasper Park Lodge, Jasper National Park, Alberta.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association annual membership meeting, Roosevelt Hotel, New Orleans.

25-28 American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-4 Gas Measurement Institute, sponsored by University of Kansas and Southwest Kansas Petroleum Industry, Legion Hall, Liberal, Kan.

3-6 Society of Exploration Geophysicists, 25th annual meeting, Shirley Savoy Hotel, Denver.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

12-14 Gulf Coast Association of Geologi-

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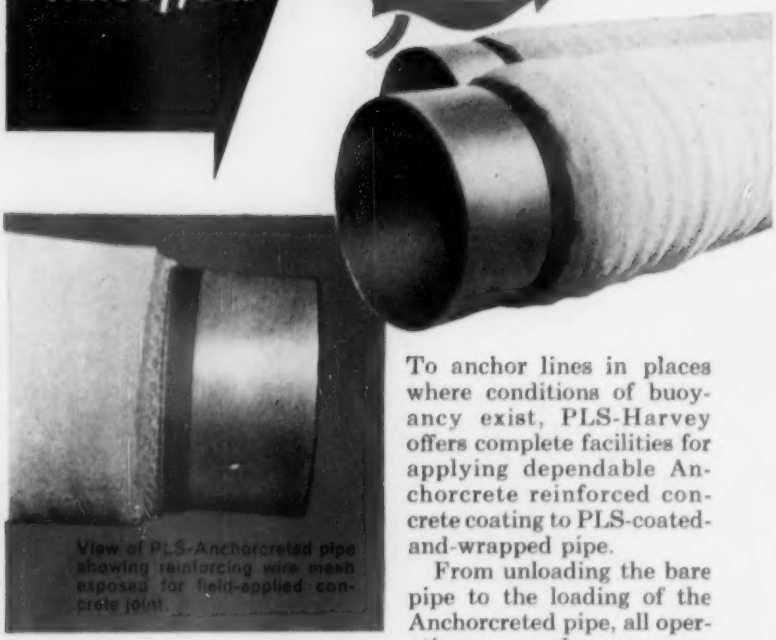

View of PLS-Anchorcreted pipe showing reinforcing wire mesh exposed for field-applied concrete joint.

To anchor lines in places where conditions of buoyancy exist, PLS-Harvey offers complete facilities for applying dependable Anchorcrete reinforced concrete coating to PLS-coated-and-wrapped pipe.

From unloading the bare pipe to the loading of the Anchorcreted pipe, all operations are under *one* supervision and responsibility. Uniform quality of Anchorcrete is assured through use of prime materials, careful batching, controlled mixing, application by specialists, and thorough curing by water spray.

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cal Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

14-15 National Society of Professional Engineers fall meeting, Peabody Hotel, Memphis, Tenn.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-21 National Association of Corrosion Engineers, South Central regional meeting, Shamrock-Hilton Hotel, Houston.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

20-Nov. 3 Atomic Energy Exposition, Carnegie Endowment International Center, Nations Plaza, 46 St. & First Ave., New York City.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

3-4 Fourth annual instrumentation conference, School of Engineering, Louisiana Polytechnic Institute, Ruston, La.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

11-13 New Mexico Geological Society, in conjunction with Roswell Geological Society, sixth annual field conference, Truth or Consequences, N. M.

13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

DECEMBER

1-3 American Chemical Society, 11th southwest meeting, Shamrock Hotel, Houston.

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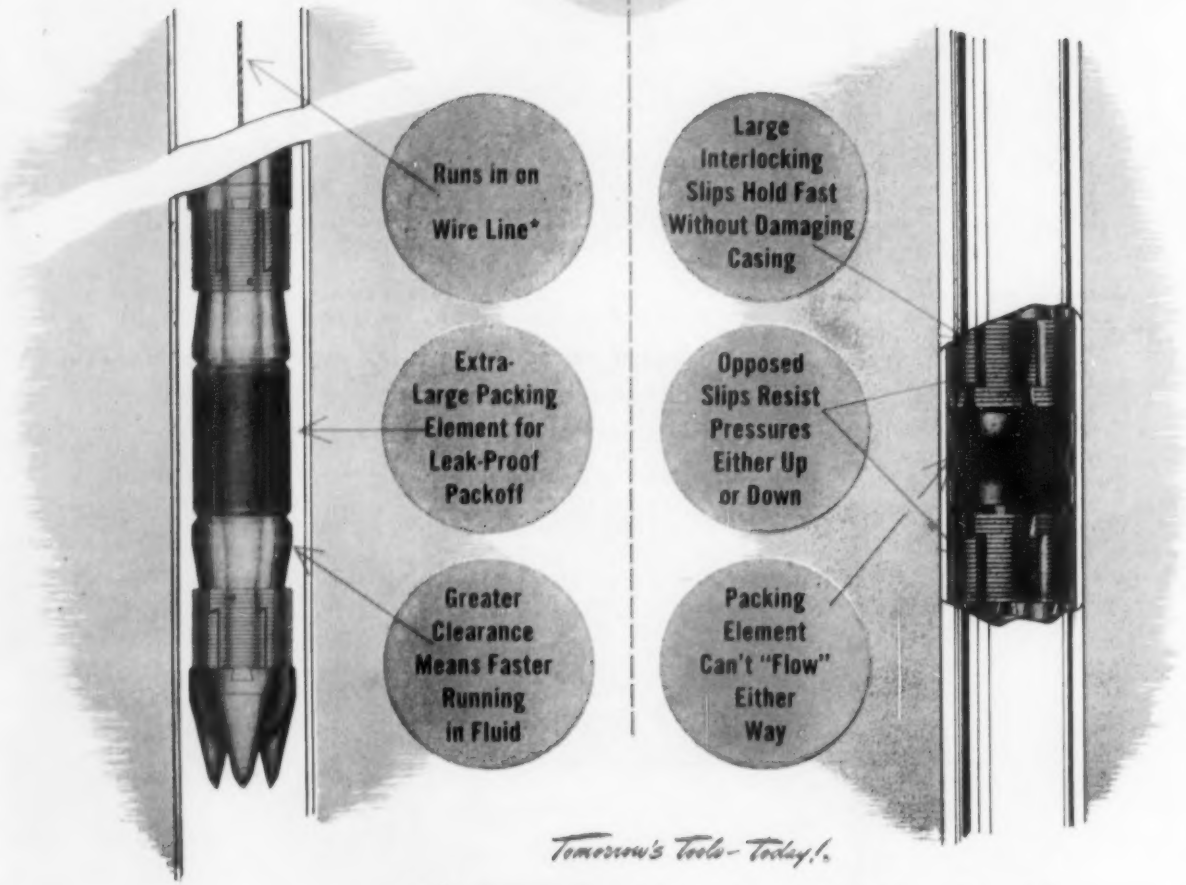
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TULSA, OKLAHOMA

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JOURNALLY SPEAKING...

Journal Editor at Work

JOURNAL reporters usually work alone. It's only when two or more go out on a story that a photograph like the one above is likely to arrive at the home office.

In this instance, Joe Reilly, above, and Ed McGhee, both of the Houston office, set out to inspect an offshore rig. Following is McGhee's report which was pasted below the snapshot:

A Drama in One Act

Title: "Reilly the Ready."

Scene: Offshore drilling platform, 40 miles from land, in the lounge.

Time: 2 p.m. on a Saturday.

Props: One big leather chair, one TV set with the ball game tuned in.

Sound effects: Dizzy Dean announcing the game; Reilly snoring.

Action: Lots on the TV, none in the lounge.

Prolog: Reilly has just had an invigorating 10½-hour boat ride to the platform. This followed 304 miles on Louisiana's highways and only 4 hours of sleep since leaving home 30 hours before.

Explanation: None. Reilly should be out climbing derrick with McGhee.

A little checking turned up the fact that neither Reilly nor McGhee knew how the game turned out until they read Sunday morning's newspaper. Reilly claims if he had stayed awake 10 minutes longer, he could have had the same picture, with McGhee the subject.

Honest Joe could have claimed to be meditating, with some support. His roundup on offshore drilling, an up-to-date description of equipment now being designed for drilling in water deeper than 100 ft., appears in this issue, beginning on page 80.

The Right Idea, But . . .

So that Joe Reilly won't feel too conspicuous here, we'll mention Reporter Bob Enright's last luncheon meeting with the Dallas Engineers Club.

Attendance was good and the food about as expected, Bob related. The fact that men on both sides and across the table were Texas A. & M. grads, however, aroused his suspicion. His fears were compounded when they began selling Aggie football tickets. A widespread inquiry answered his questions. He had wandered in the wrong door. Enright was at a meeting of the Texas Aggie Alumni Association.

In Manhattan, Too

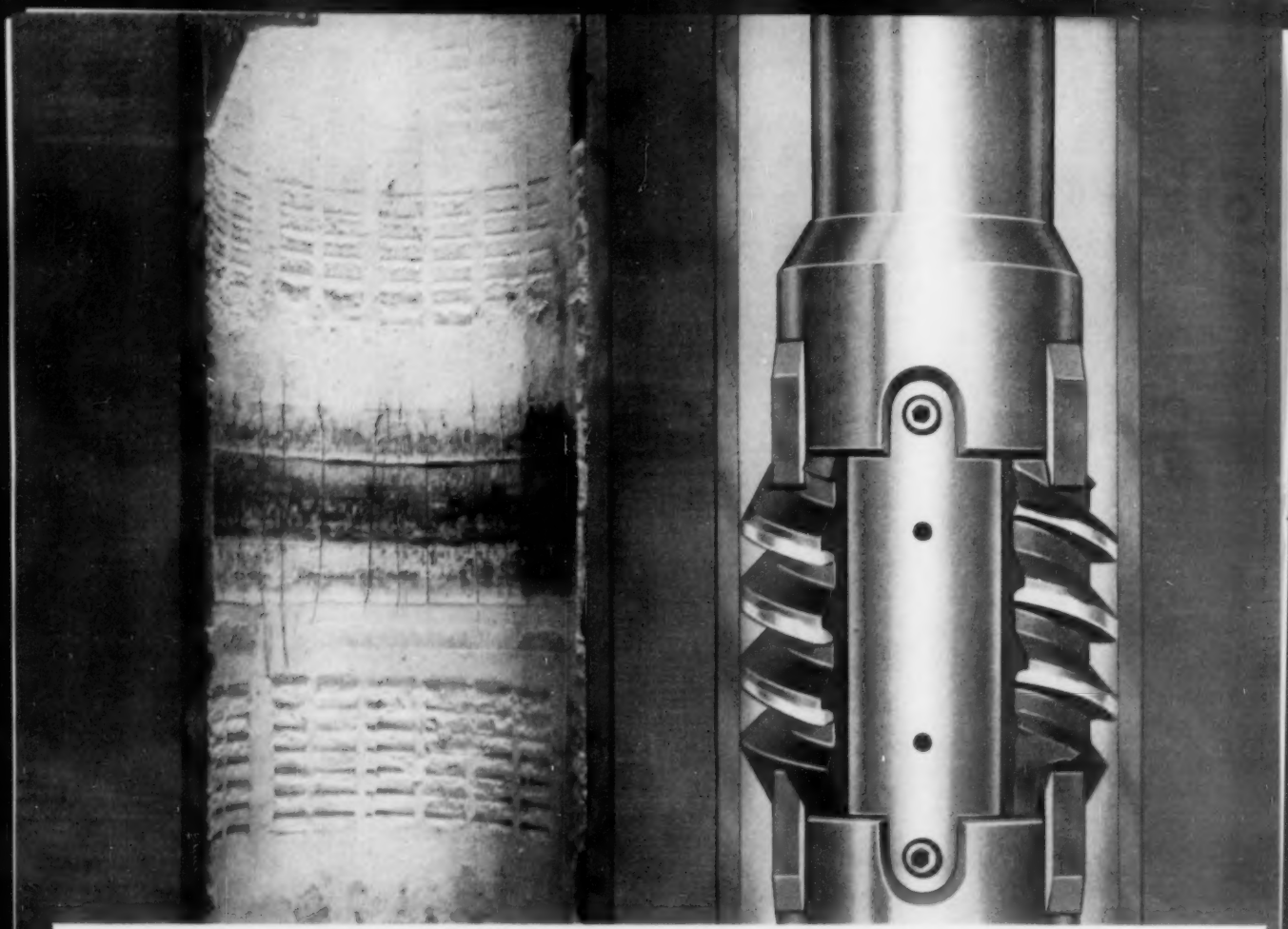
Oklahoman Paul Swain, now becoming adjusted to big-city life, has had his troubles, too. His mission: Find Venezuela's Warren Smith and get details on the Stanolind deal in Cuba.

"I grabbed your wire in my hot little hand and took off for the address without one single question or doubt. Never again!" wrote Swain.

It may have been a garbled telegram, or a bum address we sent him, but Swain wound up for the interview at Public School 59. It didn't really matter. Smith was in Havana that day.

Why relate these tales? Maybe just to show that even Journal staffers are human, too. Very!

—*Ted Armstrong.*



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You can't buy insurance for each job—so do the next best thing . . . keep your casing clean with the . . .

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This is just another way of asking "CAN YOU AFFORD THE EXPENSE OF DOWN-HOLE EQUIPMENT FAILURES?" The unretouched photograph at the above left provides visual proof of how casing neglect can cause even the best pack-off tool to fail.

In this case the pack-off tool set and packed-off perfectly—but the casing ID failed to do its part. Notice the cracks in the cement sheath in the area where the Packing Element was packed-off. *These cracks allowed the fluid under pressure to by-pass, even though the tool was securely set and completely packed-off.*

The Baker Roto-Vert Casing Scraper, which can be run on tubing, drill pipe or wire line, completely removes cement sheath and other obstructions such as perforation burrs and imbedded bullets—prepares the casing ID for subsequent work with pack-off tools. Remember, the condition of your casing ID is just as important to the successful operation of pack-off tools as the condition of a valve seat is to the operation of a valve.

Why take chances with so much at stake? The safe, positive, economical way to eliminate failures, such as the one illustrated above, is to make the running of a Baker Model "C" Roto-Vert Casing Scraper a part of your standard operating procedure.

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Killing the goose . . .

ACCORDING to present plans the first order of business at the next session of Congress in January will include the mammoth federal highway program.

Leaders of both parties favor the program, which has the active support of the President. Failure to agree as to how the highways will be paid for was the only reason favorable action was not taken at the last session.

As originally planned, the highways over a period of years were to be a charge against the nation's annual tax funds, the traditional federal policy relative to highway financing. Opposition developed and out came the proposal that the costs, which will range from 20 to 50 billion dollars, be paid for by more excise taxes on the oil and automotive industries.

That old chestnut was brought forth, "why shouldn't the automobile and oil businesses pay the bills? They are the ones that benefit." That excuse has always been used in adding to the tax burdens of the two industries.

OUR FIRST THOUGHT is that the highway program is part of the defense and Washington's interest largely stems from that fact. This was made clear by President Eisenhower in a message to the Governors' Conference last year when he warned of "the appalling inadequacies (of our highways) to meet the demands of catastrophe or defense, should an atomic war come."

Defense costs in this country have always been paid for by all peoples and not as a charge against a particular group.

In regard to gasoline, states for many years have increased excise rates. According to A.P.I.C., the average state rate is now 5¼ cents. Add 2 cents federal tax—and you have the equivalent of a 35 per cent sales tax.

The most heavily taxed industry by a wide margin, the oil business' tax bill this year will exceed 5.3 billion dollars and over 60 per cent will come from taxes on petroleum products. Equally burdensome extra taxes are effective on some phases of the automotive and associated industries.

All this springs from a wholly fallacious conception that the oil and automotive industries are something apart to be jumped on by the tax collectors under a variety of pretenses.

THE TRUTH IS that these two closely related enterprises have sparked the economy of this country since the close of World War I—never so much as right now. All industrial and business expansion has revolved around the power, fuel, and heat supplied by them.

They have revolutionized agriculture and transportation and have established the many bases around which our economy has had its phenomenal growth in all directions in recent years. Last year, as two examples, they gave steel 27 per cent of its tonnage and paid Class I railroads over 600 million dollars for transportation.

But all this can end and when it does the entire business structure will collapse. The assured way to bring this about and thus kill the goose that laid the golden egg of our economy is to continue to heap special taxes on the two industries. The limits have been reached.

Now is the time to bring these and literally hundreds of related facts to the taxing authorities at Washington—not next January.

Internal Lineup Clamp helps bring together two joints of 30" Republic Fusion Weld Line Pipe. Crews find that ends of Republic Line Pipe match up consistently, saving considerable installation time.

Welders like the uniform distribution of metal in the walls of Republic Line Pipe. It provides a good solid base for the root weld, guards against thin spots that might burn through, causing delays.

REPUBLIC CASING AND TUBING GOES IN FAST, TOO. The uniform roundness of these quality products, plus clean, full-formed threads assure fast stabbing, spinning and tonging-up. Uniform thickness of steel under the thread roots guards against disastrous pullouts. And the high-yield strength steel is extremely resistant to collapse. Republic makes both Electric Weld (in grades H-40 and J-55), and Seamless (J-55 and N-80). Order from your Republic Distributor.

THIS PIPE WELDS WITH A BRUSH, can be cut with an ordinary handsaw. It's Republic's Semi-Rigid Butyrate Plastic Pipe—the lightweight, easy-to-handle pipe that joins quickly—reducing installation costs. Moreover, it resists soil corrosion, electrolytic action—plus costly paraffin buildups. Ideal for transmission of high paraffin crudes, sour crudes, salt water and raw gas. Send coupon for facts. Also ask for information on Republic's new addition—Semi-Rigid Kralastic.

REPUBLIC'S LINE PIPE LINEUP IS TOUGH TO BEAT

Uniform roundness and straightness assure quick alignment—fast welding

No matter what size the pipe—or how long the line—installers appreciate the consistent uniformity of Republic Line Pipe. Jobs are completed faster, with less difficulty. Laying schedules can be set, knowing that they'll be met—and often bettered.

Take Republic Electric Fusion Weld Line Pipe, for example. No time is lost searching for true-fitting ends. Because circumference is always constant, field joints line up accurately. As a result, the entire perimeter can be welded at top speed.

Good welds are easy to make, too. Since uniform wall thickness assures an even distribution of metal all around the pipe, you can count on dependability in every inch of the line—with no thin spots to worry about.

Republic Electric Resistance Weld Line Pipe enjoys these same high standards of quality. Due to its highly ductile steel, it also bends uniformly and smoothly in the shop or field. And a uniform high-yield strength makes both of them ideal for building high-pressure lines.

Specify this dependably straight, scale-free line pipe for your next job. Electric Resistance Weld comes in sizes 2⅛" through 16" O.D. and Electric Fusion Weld from 24" through 30" O.D. Republic's old standby, Continuous Butt Weld, is also available in sizes ⅛" through 4" nominal.

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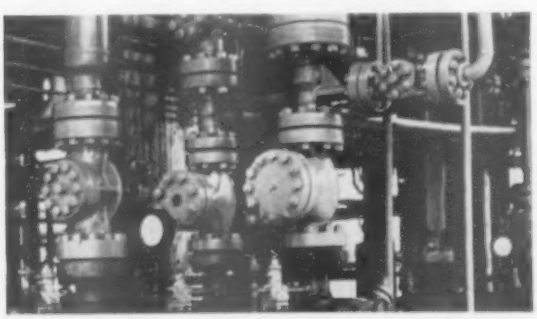

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THIS WEEK . . . . . IN THE NEWS

Production

• Hundreds of low-gravity California wells shut in since late 1953 are being reopened. The reason: continued healthy demand for residual fuels, primarily for movement to the East Coast. Some 15,000 bbl. daily of heavy-crude output was shut in when fuel-oil stocks climbed after the end of the Korean War. Now the heavy-fuels and over-all petroleum situation is changed, and there's even talk of an increase in the California crude price.

• A measure of stability is being introduced to once chaotic crude-oil marketing in the Rocky Mountain area. Crude from that region is becoming popular with refiners because of its high light-product yields. Major crude buyers have set up a system of purchaser proration and based their prices on the Midwest market less transportation. Although much oil still goes to independent jobbers at undercut prices, this is diminishing. Oil men look for better pipeline gathering systems and uniform gathering rates plus an increased demand to furnish more stability in the future.

Exploration

• Phillips gets flush Ellenburger production and a possible pay in the Fusselman in a Reagan County, Texas, wildcat. Potential test of the Ellenburger was 543 bbl. of 58.6° oil a day from 10,532-54 ft.

• Calvert Drilling gets an indicated wildcat discovery 16 miles from the Canadian border in North Dakota. The well is the first of 10 planned on a farmout from Stanolind. The apparent discovery is east and north of Tioga field.

International

• Stanolind is ready to begin the biggest exploration program in Cuba's history. The company last week signed a contract with Cia. Petrolera Trans Cuba and Cuban-Venezuelan Oil Voting Trust for exploration rights on a 12,000,000-acre concession. It provides that Stanolind spend up to $10,000,000 over the next 5 years to earn half interest in the concession. The deal raises current investment in Cuban oil exploration to some $25,000,000.

• Increased demand in Western Europe has upped throughput of Iraq Petroleum's pipeline system to 500,000 bbl. daily to Mediterranean terminals. This represents a 67 per cent increase since 1952. The hike is spotlighted by Syria's demands for increased royalty on oil transported across her borders.

• Five U. S. companies are applying for permits to test drill in Guatemala, but indications point to a delay in wildcatting until next year.

• Detailed seismic work is under way in the vicinity of the Cape Range structure of Western Australia. Earlier Cape Range 1A was shut in by West Australian Petroleum after 5 weeks of tests. WAPET has drilled seven wells in Rough Range, including five stepouts that were dry.

Offshore

• Deep offshore drilling is testing the inventiveness of shipbuilders and marine architects who must provide platforms to withstand the assaults of winds and waves 60 miles at sea. Seagoing operations are spurring a boom in Gulf Coast shipyards, which get $1,250,000 to $3,500,000 for some drilling structures. Immediate demand is for platforms to operate in water over 100 ft. deep, but some designs on the drawing board are for 200 to 300-ft. water.

• The latest weapon against corrosion in offshore operations is galvanized blowout preventers. A 14,000-lb. blowout preventer coated in Houston is believed to be the largest piece of equipment with movable parts ever galvanized for the oil industry. How long it will stave off salt-water corrosion remains to be seen.

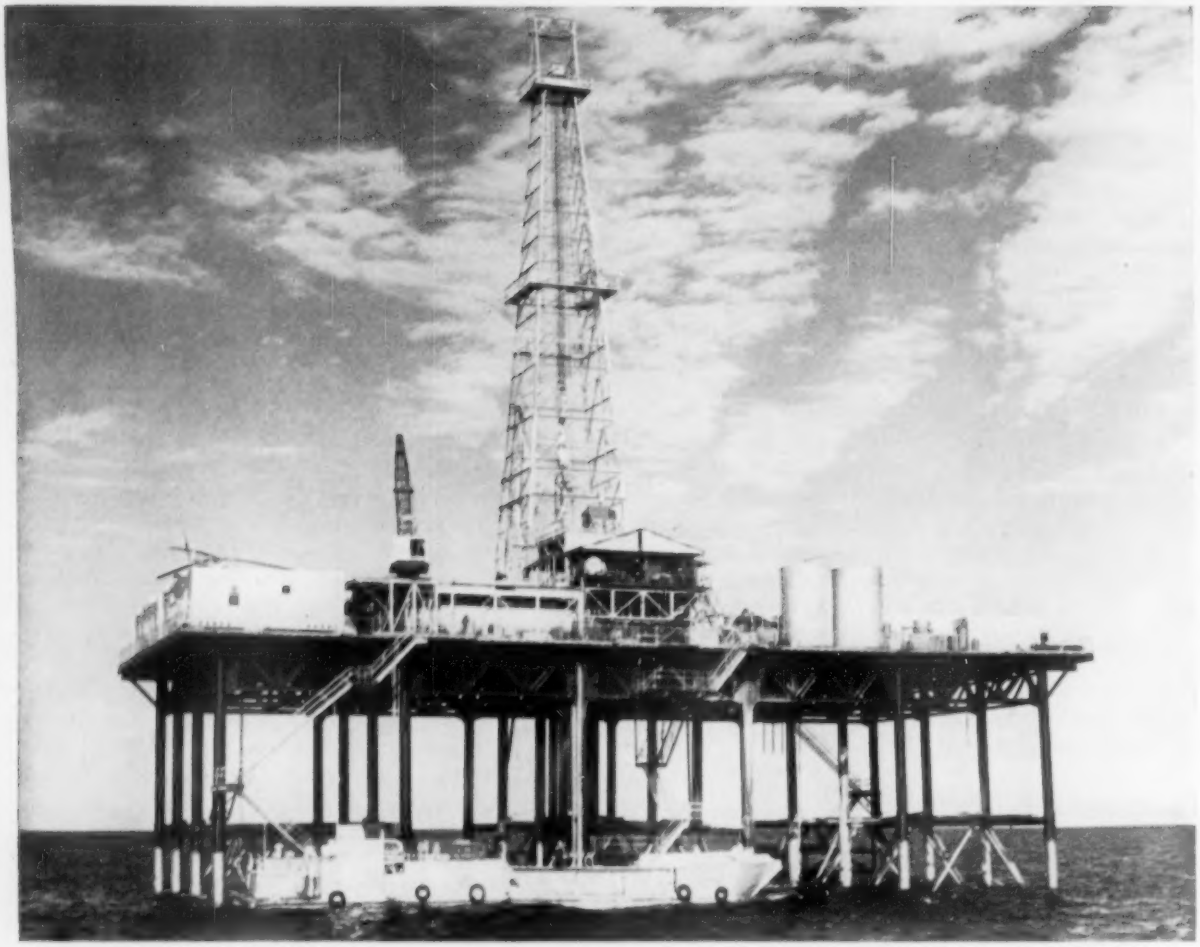
Refining

• Another refinery has become a casualty of progress. Conoco has announced plans to shut down its 4,100-bbl. daily refinery at Glenrock, Wyo., early next year. The company explained it would be economically unsound to enlarge the plant to meet future needs in the area.

• Last winter's predictions of a record increase in octane requirements because of higher compression ratios have been borne out by months of driving 1955 model automobiles. Fairly complete data is now available on hundreds of cars tested by independent laboratories and auto companies.

Pipelines

• Construction of Trans-Canada pipeline, the world's biggest, may get under way next spring. Prime Minister St. Laurent has indicated the dominion government will approve a revised plan for the long-disputed line. Government approval may signal early completion of financing. The plan outlined by St. Laurent includes both the all-Canadian route and a spur running from Emerson, Man., to near Nashville, Tenn. Tennessee Gas Transmission would take 200 million cubic feet of gas daily at Emerson for sale in the U. S.



DEEPEST WATER YET CHALLENGED is the site for this big platform. It is in water 97 ft. deep off Louisiana and is operated by the four-company C.A.T.C. group.

Designs are now being drawn for . . .

. . . Drilling in Deep, Deep Water

Joe Reilly

HOUSTON.—Seagoing oil operators are straining the inventive skill of the shipbuilding industry with their demands for new equipment to be used in ever-deeper waters.

Having spent uncounted millions of dollars in comparatively shallow waters, offshore operators now are preparing to pour millions more into equipment designed to withstand the lashing waves and high winds 60 miles or farther from shore.

Shipbuilders and marine architects have accepted the challenge with enthusiasm. The recent surge in offshore drilling has brought prosperity to shipyards all along the Gulf Coast. There's a pot of cash waiting for any shipbuilder or contractor who can turn out a good deep-water drilling structure at a price the oil company is willing to pay. And that price may vary anywhere from $1,250,000 to $3,500,000, or perhaps more in the future.

Immediate demand of big oil companies operating offshore is for a drilling structure to operate in water well over 100 ft. deep.

On the drawing boards . . . Naval architects, aided in many cases by oil company engineers, have loaded their drawing boards with platforms designed for the future. Many of these designs are patentable and still under cover.

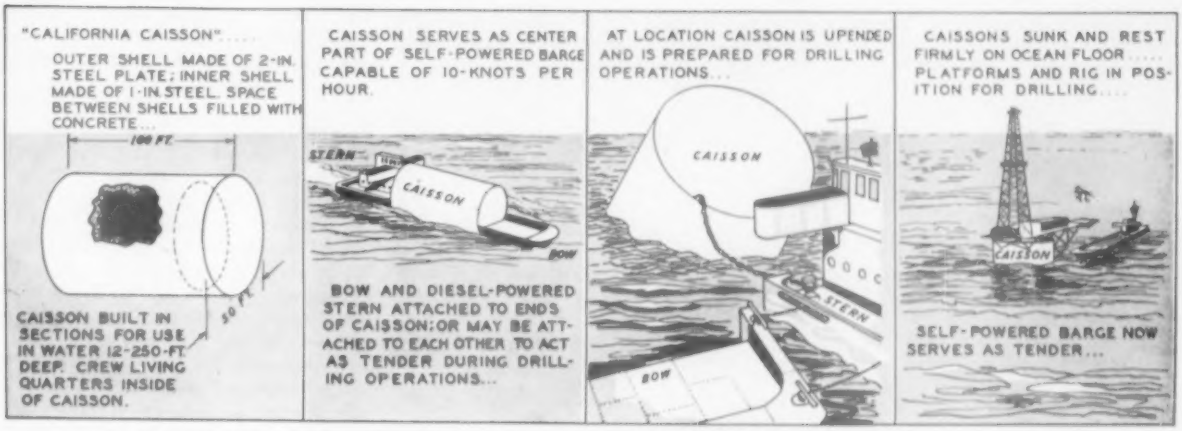
But a few have been disclosed. Although most of them stick pretty closely to the general design of conventional platforms, they involve new techniques for mastery of the sea.

Some of the drawing-board platforms are designed for water 200 to 300 ft. deep.

For 200-ft. water . . . One of the farthest advanced is that of W. Horace Williams Co., Inc., New Orleans engineers and contractors.

The platform is described as one that is "peramanent but reclaimable." Cost of the structure has not been disclosed, but it is believed to be one of the most economical yet planned for deep water.

Interlocking connectors, for which patents have been applied, make it possible to enlarge the platform merely by adding new sections. Because of its versatility, a small platform can


"CALIFORNIA CAISSON"....
OUTER SHELL MADE OF 2-IN. STEEL PLATE; INNER SHELL MADE OF 1-IN. STEEL. SPACE BETWEEN SHELLS FILLED WITH CONCRETE...
100 FT.
50 FT.
CAISSON BUILT IN SECTIONS FOR USE IN WATER 12-250-FT. DEEP. CREW LIVING QUARTERS INSIDE OF CAISSON.
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CAISSON
BOW
BOW AND DIESEL-POWERED STERN ATTACHED TO ENDS OF CAISSON; OR MAY BE ATTACHED TO EACH OTHER TO ACT AS TENDER DURING DRILLING OPERATIONS...
AT LOCATION CAISSON IS UPENDED AND IS PREPARED FOR DRILLING OPERATIONS...
CAISSON
STERN
BOW
CAISSONS SUNK AND REST FIRMLY ON OCEAN FLOOR..... PLATFORMS AND RIG IN POSITION FOR DRILLING....
CAISSON
SELF-POWERED BARGE NOW SERVES AS TENDER...

LATEST IDEA for deep-water drilling. Developer claims it could drill in water 300 ft. deep, or deeper.

be used for drilling the first well. If oil is found, new sections can be added for future drilling or to convert it into a production platform.

"If you don't strike oil there, you can pull out and move it somewhere else," adds Roy G. Cappel, engineer for the company. Moving the unit, of course, would involve dismantling and reconstruction.

Cappel predicts operators will be drilling in water 200 ft. deep within 2 years. His company foresaw the need for a deep-water structure, he says, "and we're just trying to get ahead of the crowd."

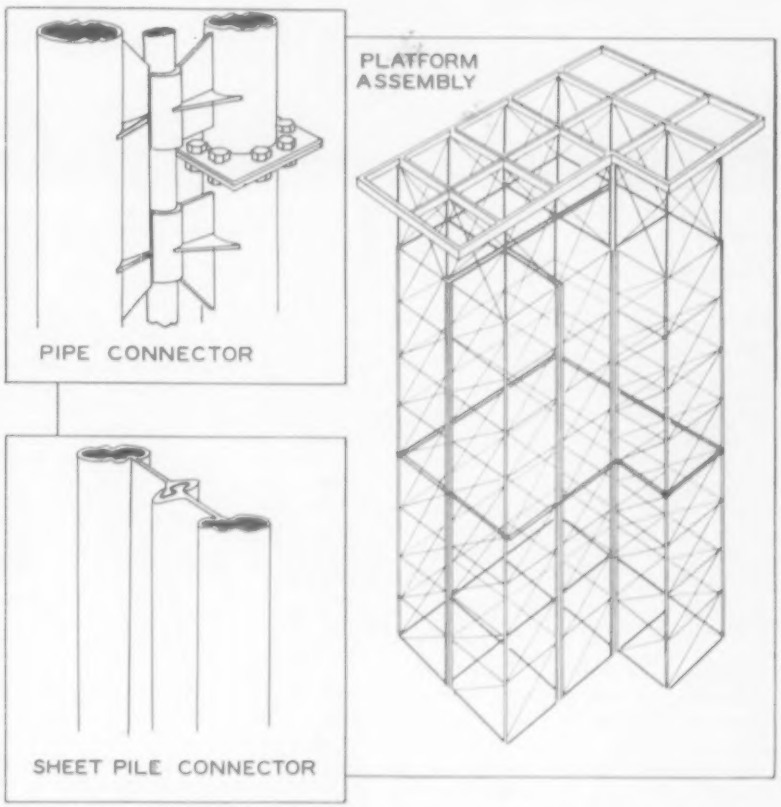
Variable design . . . The platform would have any given number of "templates," or tower units. Framework would extend about 10 ft. below the mud line and piling, driven through casing, would be planted 200 to 300 ft. deep.

Interlocking members would consist of small pipe, usually extending the full length of the templet, which would fit into a slightly larger pipe on the adjoining templet. The larger pipe would be in short lengths at each panel point and would be split so as to slide down on the smaller pipe. Other connectors also have been designed for use of steel sheet pile interlocks or interlocks fabricated from structural steel and plate.

The towers would be prefabricated of tubular materials. Plans call for the vertical pipes to be large enough to permit piles to be driven within them. The unit is designed so that the first templet would be set in one length and others added to it in sections and connected by bolted flanges.

Designers of the platform estimate it can be set up in deep water in about 4 weeks.

Platform of the future? . . . Shell Oil Co. recently started drilling its first well from a big self-contained platform which may set the pattern for many future deep-water structures.



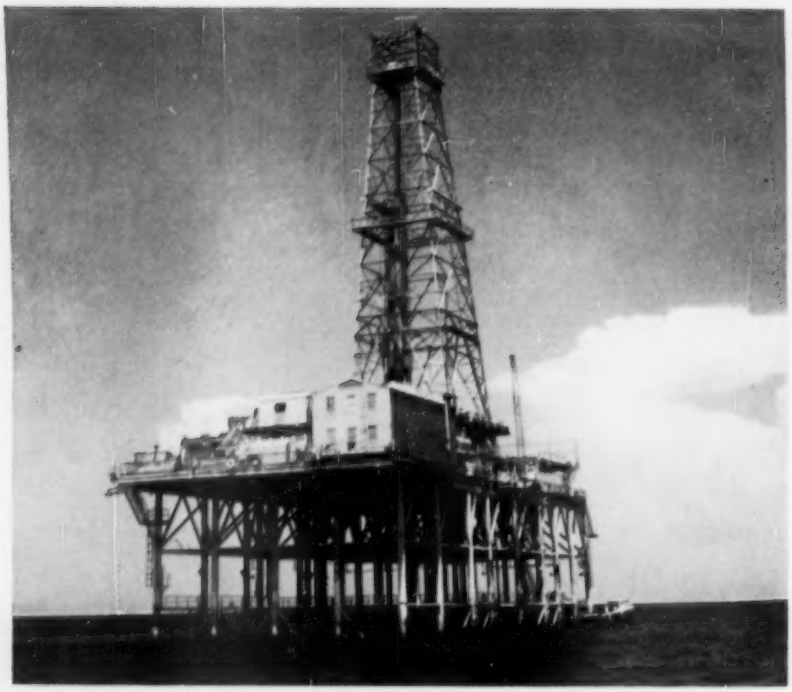
VERSATILE PLATFORM for deep water is designed for far-from-shore economical drilling. Unusual "connectors" permit expanding the surface area to permit drilling additional wells or make it suitable for production operations. Height also is variable, depending upon water depth.

In addition to the customary piles which are buried in the ocean floor and extend to the deck of the platform, the Shell structure has 12 "skirt" piles. These rise only about 15 ft. above the mud line, thereby providing the desired bracing without increasing the wave load.

The underwater structure is connected with the 24-in. skirt piles by means of a 30-in. jacket. A regular oil-well cementing job provides additional bracing for the legs.

The Shell platform was designed by J. Ray McDermott & Co., Inc., in cooperation with Shell engineers. The structure was prefabricated on shore by Avondale Marine Ways, Inc.

The same type of skirt-pile arrange-



UNDERWATER SKIRT PILES help support this new platform, which just went to work for Shell Oil Co. in the East Bay area near the mouth of the Mississippi. Although planted in only 72 ft. of water, the platform is designed to withstand 50-ft. waves and 125-mile winds. Some of its features are being adapted for platforms in deeper water.

ment was used on a platform built in the South Pass area for The California Co. These skirt piles greatly reduce the danger of overturning without increasing the surface exposed to waves and high wind. The technique used by McDermott is covered by a patent application.

The Shell platform was erected in water only 72 ft. deep, but R. N. Crews, chief engineer for McDermott, is confident the same system can be used successfully in water deeper than any yet drilled.

For mushy bottoms . . . Water depth presented a relatively minor problem to designers of the Shell platform. The big question was how to provide adequate footing. The gulf bottom is unusually soft in the East Bay area near the mouth of the Mississippi, where the platform was to be erected. For this reason, the piles were sunk as much as 370 ft. into the mud. In addition to the skirt piles, 41 full-length piles help support the platform. Each of these is 460 ft. long and extends about 45 ft. above mean water level.

The platform was designed to withstand 50-ft. waves and 125-m.p.h. winds. It cost more than $1,250,000.

Another unusual feature is the movable superstructure which allows 12 wells to be drilled from the platform. The first six can be drilled by shifting the crown block and rotary table. The entire drilling deck, derrick, draw works, engines, pipe racks, and generators can be skidded on the platform for drilling six more wells.

Upended caisson . . . In California, from which the ocean floor drops much more sharply than it does off the Gulf Coast, the possibilities of drilling in 300 ft. of water are being explored. A San Diego mechanical engineer, with an inventor's knack for solving problems before they arise, thinks he has the answer.

John G. Brown, a graduate of the U. S. Naval Academy, has conceived a combination barge and caisson which he hopes will permit oil operations in water at least 300 ft. deep. The ex-Navy man has teamed with a dry-land former Oklahoman, George de la Motte, to promote the idea through their Sub Marine Oil Operations.

The big tanklike vessel would be floated to the well site, then upended to provide a foundation for the drilling rig. When in an upright position the caisson also would provide space for equipment and supplies as well as living quarters for the crew.

In moving position, the caisson would form the center of a sectionalized, self-powered barge. At the drilling site, the water-tight bow and stern sections would be detached from the caisson. Then, by flooding compartments in one end of the caisson, the operator would be sunk to the ocean floor in an upright position. By reversing the sinking operation the caisson can be refloated and moved.

Versatile unit . . . The "California Caisson," as the unit is called, would consist of two principal parts—the sectionalized barge and a caisson 50 ft. in diameter. A self-powered unit, it would be capable of sailing at speeds of 10 to 12 miles per hour.

According to De la Motte, the craft can travel "anywhere in the world on its own power."

The caisson itself would be built in sections ranging up to 100 ft. long. It can be used in water as shallow as 12 ft. For deeper water, more sections can be added to obtain the desired height. The designers plan to place a platform atop the caisson. It would extend to one side to provide a landing deck for helicopters and for tool storage.

During drilling operations the barge, having been reassembled, would serve as a tender.

Cost is high . . . Plans call for use of 2-in. steel for the outer shell of the caisson. Inside would be a 1-in. steel shell, and the space between the two would be filled with concrete.

Brown estimates a typical unit would weigh about 2,500 tons and cost about $1,000 a ton or $2,500,000 per unit. But the inventor points out that the barge, being portable, can easily move to a new location once a field is thoroughly drilled. Then it could be replaced by a cheaper production platform.

The founders of Sub Marine Oil Operations have applied for patents on their design. "Our plan is entirely different from present methods, both patent and otherwise," said De la Motte, "but it is based upon old tried and true principles, that have proven successful in past under-water operations.

More plans brewing . . . While the California tidelands have been relatively calm, some West Coast operators have been preparing feverishly for the day when they can dive into deep water.

For the past 18 months a group of West Coast operators has been studying means of drilling off the California coast. Engineering talents of Shell Oil Co., Continental Oil Co., Superior Oil Co., and Union Oil Co. have been enlisted in a long-range program to conquer tidelands drilling problems.

Stone & Webster Engineering Corp. and Macco Corp. have been working with this group in the design of a new drilling platform. Details of the platform taking shape on their drawing

boards are top secret, but reports indicate the structure will operate in water 250 ft. deep.

Californians ready . . . The act opening a large area of California tidelands to exploration became law last week.

This act permits drilling from barges and stationary platforms, previously banned by California. In the past, development off California's shore has been confined to areas threatened with drainage through wells on adjoining leases, and drilling has been conducted either from shore locations or man-made islands. Despite these limitations, operators already have produced about 265,000,000 bbl. of oil from California's submerged lands, and the state has received more than $100,000,000 from its offshore oil resources.

Frank J. Hortig, mineral resources engineer for the California Lands Commission, recently announced there may be another 6-month delay in granting leases on submerged lands opened by the new state law.

Operators are eagerly awaiting the day they can float their rigs into the Pacific. They hope to find a prize of 4 billion barrels of oil which until then will remain out of reach.

What's the hurry? . . . Most oil companies operating in the Gulf of Mexico are in no hurry to drill the unfathomed bottoms of deep water. They have their hands full now, for they already have thousands of acres under lease which still have not been tested by the bit. And they'd much rather stay in shallow water a while longer.

The reason they're looking—some of them desperately—for new equipment is the same reason they joined the offshore oil search in the first place. That's competition.

Although the federal Government has decided to delay any further leasing of offshore lands, the companies want to be prepared to compete for choice deep-water tracts whenever they're put on the market. As one official put it, "We can't afford to sit by and let somebody else find another East Texas field out there."

Most of the deep-water platforms on the drawing boards are a long way from reality. But a few companies are planning to drill—and soon—in water more than 100 ft. deep.

In the Government's big lease sale last July, several of the most competitive blocks were in deep water. In that sale alone the Government let leases on about 40,000 acres underlying 100 ft. or more of water.

Deepest water drilled to date is in the Grand Isle area off Louisiana. There, the C.A.T.C. group has found oil under 97 ft. of water.

FARTHEST FROM SHORE is Phillips Petroleum Co.'s Dome "A" platform. It's 40 miles off the Eugene Island lighthouse and 76 miles out of Morgan City, La. Surface casing already has been set in this important wildcat.

FIRST MOBILE PLATFORM designed to operate in water 100 ft. deep is the $3,500,000 "Mr. Gus." Originally built with two platforms joined by a catwalk, the unit later was modified and made into a one-piece vessel.

Experimental work . . . J. Ray McDermott & Co., like many other designers and builders of offshore equipment, is looking several years into the future to solve problems expected to arise in deep water.

The firm is working with an unidentified major oil company in designing a structure for use in deep, deep water. Just how deep, the company will not say.

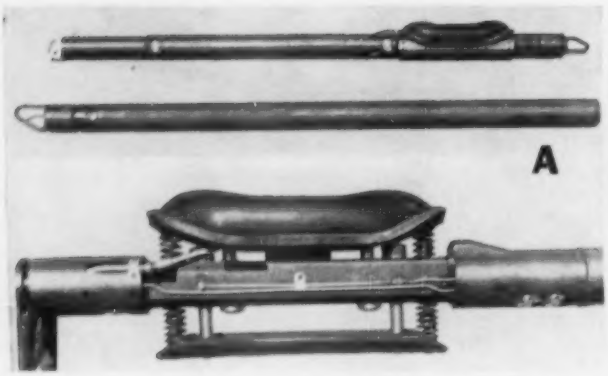
Most offshore operators and naval engineers apparently are convinced that most of the drilling in water more than 100 ft. deep will be done from stationary platforms.

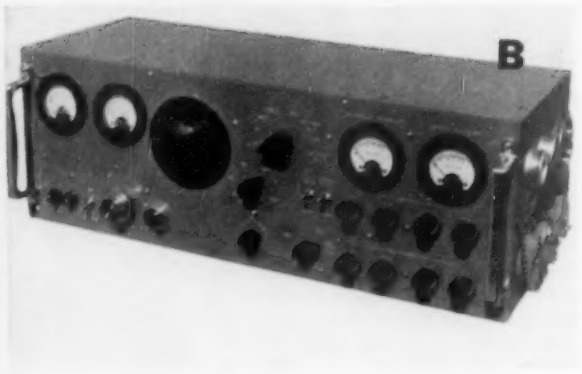
Mobile units . . . In recent months, however, several mobile platforms and submersible barges have been designed for use in 100 ft. of water.

Two floating platforms for such depths are now being built for Offshore Co. by U. S. Steel Corp. at its Orange, Tex., yard. The units will cost about $3,000,000 each.

Each of the platforms has eight steel towers rising 200 ft. in the air. When the platform is towed to a drilling site the towers will be lowered to the bottom of the sea and the platform jacked into drilling position, about 40 ft. above the water line.

The first mobile platform designed for operating in 100-ft. water was built by Bethlehem Steel Co. at its Beaumont yard. The $3,500,000 unit, known as "Mr. Gus," is owed my C. G. Glasscock Drilling Co. It is now at work in water 81 ft. deep, probably the deepest in which a mobile unit has been used to date.





Formation sampling speeded by . . .

. . . New Down-Hole Tools

Kenneth B. Barnes

HOUSTON.—You can now take formation-fluid test samples in a 5,000-ft. well in 1 hour. That's total trip time—running in, test time, and running out.

It's done on the regular type of electric logging cable.

An 8,000-ft. well can be so tested in 2 hours—again counting total round-trip time.

Time is important in all phases of rotary drilling since rig time may range from $500 per day to as much as $3,000 to $5,000 for offshore work.

The two new electric cable tools—formation tester and the fluid sampler—have been developed by Schlumberger Well Servicing Corp. to obtain samples of reservoir fluid.

The formation tester, in addition, will measure formation pressure on a surface recorder.

The tools are designed to operate in a bore hole with a full column of drilling mud. For this reason they are expected to be particularly valuable in testing formations in the deep wells common to the Gulf Coast. In field trials the tester has chalked up an 80 per cent success rate, the sampler has been 75 per cent successful.

How they work . . . The formation tester is attached quickly and easily to the logging cable through a universal head.

Adjusted to its collapsed position, it is lowered until it is opposite the formation to be tested. It is then expanded, forcing a pad tightly against the wall of the hole to form a seal between the mud column and the formation. Two bullets are fired through the pad and into the formation. Through these perforations and connecting tubes the formation fluids flow into a 1-gal. reservoir in the tool.

Throughout the operation, electrical circuits permit a complete recording on film at the surface of a self-potential curve and the progress of the test. Mechanical operations of the tool such as valve action and the firing of the bullets are shown on the film. Hydrostatic pressure of the mud column is recorded.

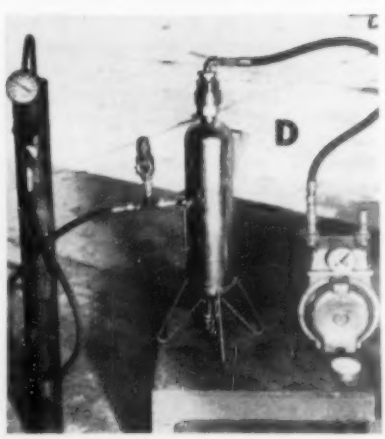
As fluids enter the tool reservoir, the recording device notes the pressure buildup, the total amount of buildup, and the time required to obtain it.

When the recorder indicates that the fluid reservoir is full, the pressure recording will read the formation shut-in pressure. At this point the reservoir is closed and the fluid sample sealed in at maximum pressure attained. The tool is then returned to retracted position and brought to the surface, where the sample is removed for detailed analysis.

Only one sample can be obtained on a trip. However, the tools are taken to the well so that multiple operation can proceed with no lost rig time.

The fluid sampler, simpler to operate than the tester, is run in a manner similar to the Schlumberger side-wall coring device. At present its use is limited to soft formations. Five bullets are lined up in the tool, each connected to a 333 cc. reservoir. When a bullet is fired, it remains connected to its reservoir by a metal tube.

Formation fluid enters the nose of the bullet and passes through the tube into the reservoir. Time is allowed for filling the reservoir, then the tool is moved up the hole and the bullet



IN THE PHOTOS: A—New "electric wire line" formation tester (for 8¾-in. hole); B—Electric panel board for recording self-potential run, pressure, and other data while formation testing; C—Operator connecting hydraulic pump to sample chamber; D—Setup of oil-gas separator assembly.

pulled free. This movement seals the sample in the reservoir. The bullet may be pulled free or left in the formation when the connecting tube is broken. Bullets left in are deeply imbedded and do not affect later drilling.

When the sampler reaches the surface, pressure of the individual reservoirs is checked. The samples are then bled off for analysis.

"Pin point" technique . . . Both tools result in a "pin point" sample of a single bed—no more than 3 or 4 in. of formation is involved.

The placement can be accurately positioned because it is controlled by observing the S.P. curve. By a series of several tests the relative positions of oil, gas, and water in a reservoir may be determined. By such a pin-pointing technique a complete profile of the anticipated productivity in a reservoir may be obtained.

North Dakota Scores

Burke County well sparks eastern Williston drilling

MINOT, N. D.—The second apparent wildcat discovery within a week has focused interest on northern sections of North Dakota.

Calvert Drilling, Inc., recovered oil on two drill-stem tests in the Charles and Mission Canyon at its 1 Gunnar Opseth in Burke County.

A 4-hour test from 6,360-6,400 ft. recovered 575 ft. of highly oil and gas-cut mud and 90 ft. of gas and mud-cut oil with no water. A similar test from 6,443-83 ft. recovered 30 ft. of sulfur mud, 450 ft. of oil and gas-cut sulfur mud with 25 per cent oil, and 180 ft. of gas and mud-cut oil with nearly 75 per cent oil.

The wildcat was drilled on a farmout from Stanolind Oil & Gas Co. and is the first of 10 wells planned in Burke and Ward counties. The first well is about 16 miles south of the Canadian border and 28 miles east and 15 north of Tioga field production.

Meanwhile Sohio Petroleum Corp. has set casing and is preparing to run production tests at 1 Ritter in Renville County. The wildcat last week flowed 3,911 ft. of oil with no water on a drill-stem test of the Madison.

The Renville strike is about 29 miles east and 11 north of the Burke discovery. It also is about midway between Bottineau County production and production in the Tioga field on the northern end of the Nesson anticline.

The two wells may spark new exploration in the eastern Williston basin which has produced few successful ventures this year.

WATCHING WASHINGTON

Bertram F. Linz

Growing Pains Persist

The steady growth of the oil business is daily raising new problems and accentuating old ones.

These problems run all through the industry, from exploration to service station. Some are scientific or technical. Others deal with legal, economic, management, and manpower matters. But they all reach back to the basic aim of the industry to wring every possible drop of oil out of the earth, move it, refine it, and get it to the consumer with a minimum of waste and a maximum of economy.

All of which is just another way of saying that when the experts in the Bureau of Mines wrote the chapter on oil and gas for the forthcoming book of "Mineral Facts and Problems," they found the problems as numerous as the facts.

Just by way of example, several hundred scientific and technical problems were suggested. There just wasn't room in the 3,500-word discussion for the other types of problems or more of the "thousands of long-range problems and tens of thousands of day-by-day technical problems" that await solution.

Summing it up, the bureau calls for better methods and tools for exploration; for review of older areas as well as studies of new ones; better drilling equipment and methods of production; greater recovery from producing properties; improved transportation means; and, of course, upgrading and making better products in refineries.

For the man who thinks he's the only one with troubles, the bureau's review will make interesting and instructive reading.

Gas Trend: More Storage

The Federal Power Commission began issuing permits for the building of natural-gas pipelines early in 1942. It issued one certificate, for 20 miles of line to cost $86,800 during the fiscal year 1942. In fiscal 1955 it issued 140 certificates for 4,927 miles of line to cost $465,-324,175.

The industry didn't really get swinging until after the last World War. Up to June 30, 1945, only 73 certificates for 3,625 miles of line to cost less than $142,000,000 were issued. Since then the FPC has handed out 1,328 permits for over 60,000 miles of line to cost $4,704,000,000. In 14 years the industry built up capacity to move more than 23,500,000,000 cu. ft. of gas daily.

Today, every major market except Florida has natural-gas service in place or authorized. This month an application was filed with the FPC for a $110,000,000 system to serve that state. From now on, FPC officials do not look for more than two or three new major lines, and most of the industry's future investment is seen directed to expansions.

The peak year for new pipeline applications was fiscal 1951, when 8,695 miles of line to cost $725,432,-984 was authorized. Since then the totals have been dropping—7,123 miles to cost $723,037,744 in fiscal 1953 and 6,405 miles to cost $400,-881,248 in fiscal 1954.

The big trend now is toward the building of storage areas nearer to ultimate markets. This will even out the gas movement and reduce the need for additional facilities to meet winter peak periods and permit capacity operation during the summer months.

Who'll Carry the Oil?

Truck and waterway transporters will come to Washington next week for the fight of their lives.

Their aim: To kill proposals to let the railroads set their own rates within limits which they say are no limits at all.

The House interstate commerce committee has scheduled 4 days of hearings on the cabinet transportation policy report. The truckers, particularly, say that if the cabinet proposals are written into law the railroads will be able to dispose of them "at one fell swoop."

The tank-truck operator is in a particularly dangerous spot, trucking interests say. With other specialized haulers, he is carrying cargo the railroads would like to have.

More oil than any other single commodity is moved by truck. There are 149 carriers engaged in hauling oil. In the second quarter of this year they handled 15,178,265 tons.

The water carriers also move large volumes of oil by barge. They, too, see the danger of being put out of business.

Shut-In Wells Reopen

Rising demand for residual fuels makes low-gravity oil more attractive; drive for California price hike started

D. H. Stormont

LOS ANGELES.—Continued healthy demand for residual fuels, principally for movement to the Atlantic seaboard and to Pacific foreign markets, is causing some large California companies to reopen hundreds of low-gravity wells shut in since late 1953 and early 1954.

When the wells were closed, fuel-oil stocks were climbing as a result of the end of the Korean war. To ease the situation, approximately 15,000 bbl. daily of heavy crudes were removed from the market when Shell Oil Co., Standard Oil Co. of California, and Tide Water Associated Oil Co. shut in wells on their fee-owned lands.

In recent months most of these wells have been restored to production. Only some 3,500 bbl. daily remains shut in, principally on lands of Tide Water. This is expected to be back on the market by early next year.

Despite action of these companies in closing this production, stocks of residual fuels continued to climb steadily in 1953 and 1954. At the close of last November, according to Bureau of Mines figures, they topped the 30,000,000-bbl. mark.

Increased West Coast demand during winter months, coupled with higher shipments to the East Coast—some of which were at "distress" prices—started a drain on residuel inventories which is still continuing.

During the first 5 months of this year an average of 18,000 bbl. daily of residual fuels was shipped to Atlantic foreign destinations and 19,000 bbl. to the Atlantic Coast. In the like period of 1954, no such shipments were made. Pacific foreign shipments averaged 51,000 bbl. daily as compared with 46,000 bbl. in the like period of 1954.

During June, last month for which Bureau of Mines figures are available, the movement was still higher. About 68,000 bbl. daily were moved to the Atlantic Coast, 2,000 bbl. to Atlantic foreign, and 68,800 bbl. daily to Pacific foreign markets.

Weekly figures of the American Petroleum Institute indicate that during July demand continued to outstrip supply, 407,000 bbl. to 347,000 bbl. daily. This would place stocks of residual fuels on July 31 at 18,400,000 bbl.—down almost 12,000,000 bbl. since last November. And the drain is thought to have continued during August.

Price raise asked . . . Due to the healthy heavy-fuels situation, and to the good over-all petroleum supply-demand picture, what may have been the opening gun for a California crude price raise was fired by the Oil Producers Agency late in August.

R. R. Von Hagen, president of Lloyd Corp., Ltd., agency president, pointed out in a letter to members that costs have risen since the last price raise in February 1953. He said equipment and materials have increased from 10 to 20 per cent, and pointed out that the oil producer's direct weekly payroll cost was up 16.1 per cent.

"A price schedule which may have been realistic then cannot be so today, with all the changes in costs and in economic factors which have occurred in the meantime," Von Hagen concluded.

Phillips Wins Chicago Bid

CHICAGO.—The Chicago Transit Authority has announced a contract signed recently with Phillips Petroleum Co. for 85 million gallons of propane at a total cost of $4,939,912. This averages 5.8 cents a gallon.

The C.T.A. said the propane will be delivered to its garages here over Phillips' products pipeline. The fuel will be sufficient to operate 1,051 buses for 194,450,000 miles in next 5 years. The authority said the big 5-year order was placed to take advantage of the low price offered.

The contract reportedly includes an escalator clause for price adjustment over the life of the agreement. Observers report the contract is one of the largest of its kind. Only larger deals have been completed with chemical companies and a few distributors.

Refinery To Close

Conoco decision will doom small plant in Wyoming

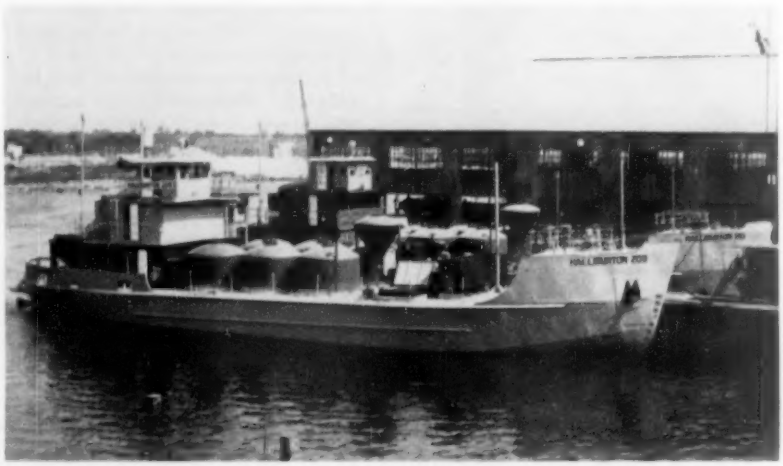
GLENROCK, Wyo. — Progress apparently has doomed another small refinery.

Continental Oil Co. last week announced plans for shutting down its 4,100-bbl. refinery here early next year.

J. W. Liddell, vice president and regional general manager, explained it would be "economically unsound" to enlarge the plant to meet the company's future needs in this area.

"We are not certain of the exact date we will discontinue the refining of oil, but during the next 6 to 8 months we expect to develop plans as to just what may be done," Liddell said. "The plant may be sold, dismantled, or converted to other operations."

The Glenrock refinery is one of the smallest operated by Continental. The company recently announced plans to modernize its refinery of comparable size at Artesia, N. M. This project will include construction of a 1,500-bbl. catalytic reforming unit at a cost of about $500,000.



Cementing Ships Join Halliburton Fleet

Recently completed at the Higgins, Inc., yards near New Orleans, these two ships bring to 14 the number of craft operated by Halliburton Oil Well Cementing Co. off the Louisiana Gulf Coast. Each of the new cementing ships measures 127 ft., 7 in. in length. Six steel cement silos, with 800-sack capacity each, and two "gel" silos are located on the decks.

Gas-Sale Ruling Hit

Northern Natural fighting decision on boiler-fuel sale

WASHINGTON.—A proposed Federal Power Commission ruling that would impose end-use controls on natural gas was challenged last week.

Northern Natural Gas Co. protested an FPC examiner's recommendation that it not be allowed to sell gas to Northern States Power Co. for boiler fuel.

Examiner Francis L. Hall held the gas would be sold below its actual commodity cost, against conservation principles and to the disadvantage of the coal industry *(The Oil and Gas Journal, August 29, page 68)*.

The company protested all of the examiner's findings. It denied the gas would bring less than its commodity cost and said the deal will bring in $1,200,000 a year more than the cost of the gas.

Northern Natural Gas also objected to Hall's views on conservation. It pointed out that conservation doesn't mean keeping gas in the ground but, rather, its efficient and economic use. The sale to Northern States will meet this test by permitting greater use of pipeline facilities and bringing in revenue which will protect prices to other customers.

Not in tradition . . . The commission was reminded that it has not in the past favored the extension of its jurisdiction to the extent suggested by Hall to regulate direct sales.

And it was pointed out that neither the commission nor the courts have ever held that the Natural Gas Act requires the FPC "to create or perpetuate a monopoly in the sale of energy resources for the benefit of the coal industry."

The examiner's report also brought reaction from coal interests. They asked the commission to hold oral argument in which, presumably, they would strongly support Hall's recommendations.

The FPC did not immediately say what action it would take. It can accept the examiner's report, or turn it down and issue its own decision. Or it can order oral argument which, in view of the importance of the issue, is the most likely course.

Free Gas Law Attacked

OKLAHOMA CITY.—Phillips Petroleum Co. has filed suit in U. S. District Court here attacking constitutionality of an Oklahoma law requiring gas producers to furnish free fuel to land owners to operate irrigation pumps.

Phillips, in suing the state Corporation Commission and a dozen land owners, claimed the law takes private property without due process of law. The law was passed by the 1955 state legislature after western Oklahoma farmers and ranchers claimed they were unable to get sufficient gas to operate their pumps for irrigation.

Fire Product Loss Heavy

CHICAGO.—Loss of refined products in the recent fire at Standard Oil Co. (Ind.) Whiting refinery totaled 724,000 bbl., the company reported to the American Petroleum Institute.

The loss breakdown showed: Gasoline 179,000 bbl., kerosine 56,000 bbl., distillate 98,000 bbl., and residual 401,000 bbl. Total crude loss was not reported. Officials estimate the August 27 explosion and fire did from $10 to $20 million damage to units of the 220,000-bbl. plant *(The Oil and Gas Journal, September 5, page 62)*.

Export Bank Aids Dresser

WASHINGTON. — The Export-Import Bank has granted Dresser Industries, Inc., Dallas, a credit line of $1,300,000 to assist in financing export sales.

Dresser will use the credit to finance sales of heavy machinery for the oil, gas, and chemical industries and rigs for oil-well service.

Under the credits set up by the bank, the exporter is required to obtain payment in cash of not less than 20 per cent of the export sales to be financed. The exporter also must carry less than 25 per cent of the deferred payments. The bank guarantees against default without recourse to the exporter up to 75 per cent of the deferred payments.

The Export-Import credit lines have become big business. Starting last November the bank already has made 108 agreements for credits totaling $152,970,000.

New Lease Fee Adopted

WASHINGTON.—The Bureau of Land Management is now imposing a service charge for the handling of offers for noncompetitive oil and gas leases and applications for prospecting permits, leases, or licenses.

The bureau last week amended its regulations to provide that a filing fee of $10 must accompany offers and applications. The fee will be retained as a service charge even though the application or offer is rejected or withdrawn.

Wage Drive Begun

Tulsa local spearheads pay-increase movement

DENVER.—Pressure is being applied from the "grassroots" to gain substantial wage increases for union oil workers in the United States and Canada.

Tulsa Local 5-217 of the C.I.O. Oil, Chemical and Atomic Workers International Union is spearheading a drive among other locals to seek increases in all new contract negotiations. The movement has the consent of international union headquarters here.

O. A. (Jack) Knight, O.C.A.W. president, declined direct comment on the Tulsa local's drive but added: "There is a strong possibility that within a few months we may launch a new campaign for 1955 wage increases."

The last wage increase in the industry was an average 10 cents an hour granted last March to about 100,000 oil workers in the 200,000-member O.C.A.W. At that time Knight termed the action "a wage increase in 1955 which was due in 1954."

Union's views . . . The Tulsa local, headed by Len Yarborough, mailed letters to other O.C.A.W. locals urging support of a wage-increase movement. The amount of the increase proposed was not mentioned, but the letter cited the recent 30-cent-an-hour pay hike won by the coal miners.

Yarborough said his union is contending the last real pay increase given in the oil industry was the 8-cent hourly hike granted in 1942. All increases since then were labeled "cost of living increases." He claimed the workers actually are getting less in real wages when tax increases are considered.

The Tulsa local's effort is chiefly a publicity and information campaign to influence the international union's bargaining policy committee which formulates union-wide wage programs. The committee has not met since the March round of wage increases.

Knight said there is no current union-wide bargaining program and added many locals are bargaining on wage increases on their own initiative.

FPC "Vacation" Ends

WASHINGTON.—The Federal Power Commission resumed hearings on natural-gas cases last week after a month's "vacation."

Over the next 8 weeks the commission will take up some 38 cases, including those of a number of independent producers seeking approval of prices for sales to interstate pipelines.

MORE WYOMING BLACK OIL for the market is indicated by this t uckload of casing heading into a new field in Elk basin. (Standard Oil Co. [N. J.] photo.)

Rocky Mountain Crude Finds Its Market

- Midwestern refiners discover Denver-Julesburg oil gives higher light-end yields, prefer it to Mid-Continent crude
- Marketing chaos ending; but lack of uniform pricing, no proration, unequal gathering tariffs burden producers

Henry D. Ralph

DENVER. — Crude-oil marketing in the Rocky Mountains is much less chaotic than it was a year or so ago, and the basis is being laid for a reasonably orderly system.

Getting crude oil to market, particularly from the newer producing regions such as the Denver - Julesburg basin, is considerably different than in the Mid-Continent and Texas areas. This has caused much misunderstanding in these other regions. It even has led to charges that Rocky Mountain crude is underpriced and is taking markets away from other states unfairly.

The principal factors involved in the Rockies are:

. . . **Lack of uniform posted** prices in the Denver-Julesburg basin and some other new areas of the Rockies.

. . . **Construction of three large** pipelines to the east, all with unused surplus capacity.

. . . **Lack of pipeline** gathering systems for all fields.

. . . **Construction of some short** intrastate pipelines which do not have joint through tariffs with the interstate lines.

. . . **Lack of market - demand** proration or, for the most part, any other effective regulations restricting the output of crude per well.

. . . **Lack of producer financing** by banks on a scale customary in older producing regions.

. . . **Operations of independent** crude-oil jobbers.

Most surprising fact is the lack of conventional posted field prices for crude in the D-J basin. Even many of the producers in these fields are not aware of this. Custom and competition have set "going" prices in the fields. No crude-oil purchaser holds itself out to purchase crude in the fields in the way that is done in most other regions.

At present something in the neighborhood of 100,000 bbl. per day is being produced in the Denver-Julesburg basin, but all of it is being purchased by the major buyers at pipeline tariff points. The producer in effect has to absorb gathering costs and deliver the crude into the pipeline in 10,000-bbl. tenders.

Competition . . . Rocky Mountain oil men insist their crude is exactly competitive with Mid-Continent crude in Chicago. This is true to a certain point. But there are gimmicks which work to the advantage of eastern refiners and to the disadvantage of Denver-Julesburg producers. Prices for Rocky Mountain crude are determined by starting with the value of crude at Chicago and working backwards.

Mid-Continent crude of 40° gravity has a posted field price of $2.90 per barrel. After the refiner pays the gathering charge and the pipeline tariff, this crude costs $3.31 per barrel in Chicago. So the price of Denver-Julesburg 40°-gravity crude is determined by subtracting from $3.31 the pipeline tariff, which is 35 cents per barrel from Gurley, and a loss allowance of 3 cents per barrel.

This produces a price of $2.93 per barrel delivered into the pipeline at trunk-line tariff points in the Denver-Julesburg basin. On the face, this makes it appear that D-J crude is 3 cents higher than Mid-Continent crude.

Premium crude . . . But there are offsetting factors. For some reason, Denver-Julesburg crude has a higher gasoline yield and a higher octane yield than Mid-Continent crude of equal gravity, and thus is worth more to refiners. Producers in the region call D-J crude the most desirable crude in the world. Its excellent refining characteristics have caused many refineries east of the Mississippi River to prefer it to Mid-Continent crude.

Another factor is the existence of empty pipeline space in the three big lines.

The Platte line has a capacity of 190,000 bbl. per day and is currently moving about 102,000 bbl. daily east of Gurley. The Arapahoe line has a ca-

pacity of 80,000 bbl. and is currently moving about 55,000. The Western line has a capacity of 150,000 bbl. and is moving about 70,000.

This gives a total crude capacity from the Rockies to Chicago and Wood River of 420,000 bbl. per day and current movements of about 227,000 bbl., leaving unused space of about 193,000 bbl. per day.

The Rocky Mountain region probably could not produce enough crude to fill this unused space at the moment and also take care of other markets for crude in refineries in the region. However, it might be able to fill most of it within a year or so if eastern markets can be found for it. For instance, the Butte line now under construction from eastern Montana to Guernsey and Fort Laramie will add a considerable volume of crude to the eastward movement.

The owners of these new pipelines naturally want to earn as much as possible as soon as possible. So they have been putting all legitimate pressure they can muster on crude buyers to use Rocky Mountain crude instead of crude from other sources. Their aggressiveness in this is an intangible but important factor in the switch in crude sources.

Need cash quick . . . Producers in the Rockies, particularly independents in the Denver-Julesburg basin, have often been well nigh desperate for money upon bringing in a new well. In older areas, such as Texas and the Mid-Continent, banks are accustomed to making loans to producers. They have efficient oil departments that can evaluate a producing property on the basis of cores and well logs. In the older areas, too, pipeline connections are normally taken for granted, and producing rates are regulated by state proration rules.

Such easy financing has not been available in the new producing areas of the Rockies, with the result that some producers often are willing to sell crude at almost any price in order to get cash. This condition is gradually improving, but it is still something of a factor in explaining the many rumors prevalent in the Mid-Continent that much Rocky Mountain crude is moving at "cut" prices.

Because all crude is priced at pipeline tariff points, almost every field has a different wellhead price. Often the price is different among wells in the same field.

For example, some fields near Gurley are connected with a gathering system which charges 7½ cents per barrel freight. Deducting this from the $2.93 paid at the pipeline, this give a field price of $2.85½. But another gathering system in the same area charges 10 cents, so the wells connected to it get a price of $2.83.

Two intrastate pipelines, the Goodall and the Pawnee, run from Adena, Little Beaver, and other fields in the southern part of the D-J basin to a connection with the Arapahoe trunk line east at Merino. Their tariffs are 15 cents per barrel plus one-half per cent, or approximately 16.4 cents. So fields connected to them have a netback at the wellhead of $2.76½.

However, the Sterling line, which feeds into the Platte at Gurley, is an interstate line and has a joint tariff of 35 cents to Chicago from any point on its line. Thus fields connected with it get the full $2.93 less whatever it costs the producers to get tenders of 10,000 bbl. or more into the line. Since all three of these feeder lines serve the same general region, the lack of uniformity in wellhead prices is most confusing.

The Pawnee system is jointly owned by Pure and Sinclair, the two largest purchasers in the D-J basin. Sinclair has owned half of the Goodall line and recently bought out the Goodall interests to make this a 100 per cent Sinclair facility. The "dope" in Rocky Mountain oil circles is that Pure will soon purchase a half interest in the Goodall system, although there seems to be no factual basis for this.

The general expectation is that some time in the not too distant future both the Pawnee and Goodall lines will drop their status as intrastate feeder lines and will come under the Interstate Commerce Commission. Then they will file joint tariffs with the trunk lines in the same manner as the Sterling system. This will make all fields served by the three systems competitive—after the crude gets to the pipeline tariff points.

Independent jobbers . . . A great many wells in the Denver-Julesburg basin and elsewhere in the Rockies are not connected to gathering systems. This means that the oil has to be trucked to the tariff points and accumulated in storage tanks until delivered to the pipeline. The producer has to absorb this cost.

There are a number of oil-trucking firms, and their charges are regulated by the state utility commissions. The charges vary from state to state and from field to field. Charges may be as low as 12½ cents per barrel or as high as 50 cents or more, but a representative figure would be 25 cents per barrel.

Because crude buyers will not go to the lease tanks for oil in many parts of the Rocky Mountain region, quite a business in independent crude-oil jobbing has grown up.

The bulk of this business currently is done by one concern, Western Crude Marketers, Inc., of Denver, headed by Cortlandt S. Dietler, son of Ralph O. Dietler, chairman of the board of Stanolind Oil Purchasing Co. A relative newcomer to the field is Fowler Petroleum, Inc., headed by Bert Fowler, formerly a crude buyer for majors in Midland, Tex., and Wichita, Kans.

These jobbers, or intermediate buyers, purchase crude at producers' lease tanks at whatever prices they can negotiate. They have their own gagers, pay for the crude on division orders in the same way as major buyers, blend various grades of crude, and accumulate it in their own storage tanks at pipeline tariff points. They may use their own trucks or contract with other truckers. Western Crude Marketers, for instance, owns about 40 tank trucks, operating under the tariff charges set by the state utility commissions.

The jobbers scout for markets among refineries in the Midwest. Michigan refineries currently are by far their best market. Instead of selling crude delivered at the refineries as the major purchasers do, they sell at the pipeline tariff points in the Rockies. In this way the refiner rather than the dealer pays the pipeline tariff, cost of storage in transit, and carrying charges on the value of the oil during its movement.

Perform service . . . These intermediate purchasers have performed a real service to producers in new fields. This is freely admitted by the major companies even though in some ways they are a thorn in the majors' sides.

They have assisted in financing producers by providing markets where no markets existed because of lack of pipeline connections, lack of business contact with eastern refineries, and the reluctance of major companies to go after crude because of the general oversupply in both the Rocky Mountain and Mid-Continent regions.

Most fields in the Rockies have no proration of any kind worthy of the name, and a well may produce as much as it will. The major buyers have instituted purchaser proration. Sinclair Crude Oil Co., for instance, will buy no more than 125 bbl. per well, and most of the other principal purchasers have more or less similar restrictions.

The intermediate buyers take advantage of this situation by taking all the oil a producer wants to give them—provided they like the wellhead price. Thus they may take several hundred barrels per well per day from a lease offsetting wells of a major or other producer which are held down to 125 bbl. per day by purchaser proration.

This has resulted in inequities and

NOW FINDING A GOOD MARKET is oil from this area—Wyoming's Elk basin. Long a drug on the market, this high-sulfur crude is now in strong demand. (Standard Oil Co. [N. J.] photo.)

dissatisfaction, to say the least. In some cases it probably has contributed to overproduction, loss of reservoir energy, excessive gas flaring, and reduction in ultimate recovery.

This makes the intermediate purchasers highly popular with producers who want a fast payout from their wells even at a lower price per barrel, and highly unpopular with those companies that want crude marketed in an orderly manner and the fields produced slowly over a long period under principles of conservation and reservoir engineering.

"The majors could practically put me out of business overnight by posting field prices," one intermediate purchaser admitted. "And if the states would control gas-oil ratios or establish per-well allowables of some sort, I would be reduced to purely a trucking operation.

"In the meantime I am providing a service to independent producers and am making a living by taking advantage of conditions that exist in this region. My operations are perfectly legal in the states where I operate, though of course they would not be in Texas, Kansas or states with allowables."

Price economics . . . Rumors of "cut price" Rocky Mountain crude, which have been circulating in the Mid-Continent for the past year or so, apparently are greatly exaggerated or based on incomplete information. The wellhead net return figured back from the $2.93 price at trunk-line tariff points is considered by producers to be the posted price.

The net return at the lease is thus considerably lower than the Mid-Continent gravity price scale, but the delivered price to Chicago, for example, is the same.

However, there is some crude which is "underpriced," even by the Rocky Mountain definition of going prices. This includes crude which intermediate purchasers buy at wellhead prices lower than what the producer would net if he sold to a major buyer at pipeline points. Also, some producers do their own gathering and find their own refinery markets, and are willing to take a relatively low netback at the lease.

The volume of this "underpriced" crude is uncertain.

One important purchaser estimated it at around 20,000 bbl. per day in the Denver-Julesburg basin and 15,000 bbl. per day in other parts of the Rockies, mostly Montana. On the other hand, another buyer, in position to be equally well informed, estimated the volume at not more than 8,000 bbl. per day in the D-J basin and probably less than that in other parts of the Rockies.

All agree, however, that the market is stabilizing and that chaotic conditions are on the way out. There always will be some fields so small or so remote as to require trucking. But it is expected that gathering systems will be built through the more important fields.

If the eastern markets for Rocky Mountain crude continue to improve, and as the trunk lines develop sufficient volume to provide a respectable payout, the producers expect the major buyers to post field prices in most of the areas that now lack postings. Some are betting that this may come within 6 months or a year.

The gross overproduction is also diminishing.

Flush production has already pulled down the potentials of many fields, and many wells can no longer make even the 125 bbl. per day allowed by purchaser proration. The purchasers do not attempt to impose per-well allowables, but will take 125 bbl. times the number of wells on the lease, so good wells are often averaged off against the poor ones, but in spite of this the average production per well is believed to be declining.

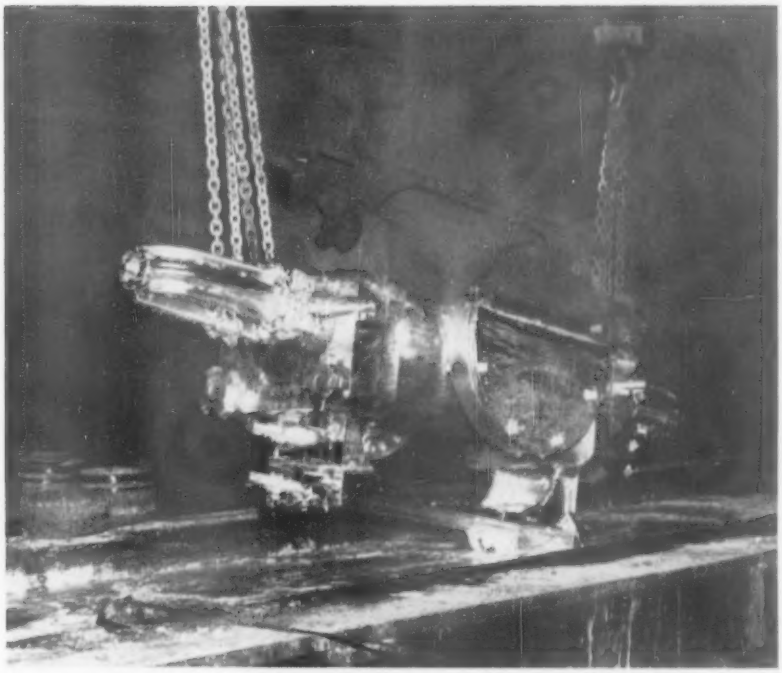
Strange comeback . . . A phenomenon of the region is the strong demand for flat-price sour crude, otherwise known as Wyoming black oil.

This crude, which has a gravity range from about 14° to 20°, was a drug on the market for many years and some fields producing it remained shut in for long periods. Demand started picking up a year or more ago and not long ago the price was raised. It is now posted at $1.75 per barrel, some selling at $1.80. Buyers cannot acquire as much as refineries want, and there is some talk that the price will be raised again. However, it is doubtful that a price increase would bring out much additional supply, as most fields producing this flat-price sour are believed to be operating at their M.E.R.'s.

The principal reason for this is that refiners have now learned how to handle this heavy crude and to get a products yield, at its present price, more profitable than that from some lighter crudes. Installation of cokers and other new process equipment is partly responsible.

Another factor is the strong demand for heavy fuel oil in the Rocky Mountain region. This demand has surprised everybody, and led to an increase in price in the middle of the summer—a season when the market for resid is usually at its lowest ebb. Asphalt and road oil, other high-yield products of Wyoming black oil, are also in exceptionally strong demand due to the extensive highway construction program throughout the Rockies.

It is a curious fact that in spite of all the drilling and exploration work in recent years there have been no new major discoveries of heavy, sour crude. Ironically, this black oil which characterized Wyoming's oil industry a quarter-century ago, and then was spurned by refiners for so many years, has now come into its own. The old Wyoming black oil and the new Denver-Julesburg high-gravity crude are now two of the most sought-after crudes in the nation.



BLOWOUT PREVENTER emerges from its molten-zinc bath.

To check offshore corrosion . . .

. . . Equipment Galvanized

HOUSTON. — Galvanizing blowout preventers is the latest weapon used by offshore oil operators in their costly fight against corrosion.

A speedy process for galvanizing such equipment recently was developed by Nowery J. Smith Co., Houston, an associate of Tyson Smith Co. So far the company has experimented with zinc coating on two blowout preventers, both ordered by Offshore Drilling Co.

The 14,000-lb. blowout preventer, pictured above as it emerged from its zinc bath, is the largest built by Cameron Iron Works, Inc. It is believed to be the biggest piece of equipment with movable parts ever galvanized for the petroleum industry.

Because of its size, the blowout preventer must be dipped in two operations—one side at a time. The actual galvanizing requires only 3 to 5 minutes per side, but the operation is not as simple as it appears.

Pickling comes first . . . First step is a "pickling" process to clean the equipment. This involves bathing the blowout preventer in sulfuric acid, then in rinse water and muriatic acid to remove scale, oil, and other foreign matter.

The pickling is done at the Nowery J. Smith plant. From there, a flat-bed truck hauls the heavy piece of equipment back to the Cameron works, a distance of about 2 miles. There it is preheated to about 800° F., reloaded on the truck, and returned to the galvanizing plant.

During the 2-mile trip, the heavy parts retain most of their heat, cooling only to about 700° F. The lighter parts cool much more quickly but are easily reheated to the desired temperature.

When the blowout preventer is dipped into the zinc bath, which has been heated to about 850° F., the bath and the metal rapidly approach the same temperature. The molten zinc is in a kettle 30 ft. long, 50 in. wide, and 50 in. deep.

Working parts of the blowout preventer must be carefully guarded against damage from the heat, acid, and zinc. Rubber packers seal the working surfaces during the acid bath. These are replaced by asbestos gaskets before heating.

Future for galvanizing . . . The entire process costs several hundred dollars. Neither the manufacturer nor the galvanizing firm is making any promises about its success in preventing corrosion. A spokesman for Nowery J. Smith pointed out, however, that galvanized metals under normal conditions often last 20 years, or up to four times their normal life. How long they will last when exposed to salt-water spray remains to be seen.

Deep Zones Tested

Alabama wildcat has two possible producing sands

MOBILE, Ala.—Production tests are under way at Zach Brooks Drilling Co.'s indicated Lower Cretaceous discovery 25 miles northwest of here in the Citronelle area of northern Mobile County.

Initial tests at the 1 Donovan are in the deeper of two Rodessa sand zones in which promising oil showings were encountered. Cores below 11,274 ft. in this deeper zone recovered a total of more than 50 ft. of oil-showing sand with porosity.

Best showings were in core recoveries at 11,403-19 ft. and 11,446-63 ft. Core analyses since then, however, show a total of only 25 ft. of net oil-showing sand with sufficient permeability to produce.

Hole was cored to 11,517 ft., the well's total depth, and has 7-in. casing run to 11,514 ft. for production tests and completion. Bottom cores recovered only tight sand with slight shows.

No drill-stem tests were taken in the lower oil zone, believed to be the equivalent of the prolific Bailey sand in Mississippi's Soso field, 75 miles northwest.

The well also is a potential producer in a shallower Rodessa sand, where an 8-minute drill-stem test earlier recovered 1,800 ft. of clean 40.5°-gravity oil, plus 180 ft. of oil-cut mud.

Esso to Quit Wax Sweating

BAYONNE.—Esso Standard Oil Co. will abandon wax sweating next year when new filter capacity is completed on the 7,500-bbl. per day methylethylketone dewaxing unit. The project will adapt a new process developed by the refinery's process-engineering division.

Conventionally, the MEK unit handles waxy distillate from the pipe still, separating it by solvent extraction into wax and oil fractions. The wax fraction containing about 2 per cent oil then goes to the sweaters where oil content is reduced to 0.2 per cent.

Under the new setup, the wax from the existing filters of the MEK unit will be contacted with new cold solvent and filtered through the three new filters. This second extraction stage will reduce oil content to the same 0.2 per cent level, making the sweaters obsolete.

Driving Tests Confirm Octane Forecast

Extensive laboratory and road experiments prove higher grade fuel required for 1955 high-compression engines

NEW YORK.—Months of driving the 1955 model automobiles have proved one prediction made last winter when the models were first introduced. The big jump in compression ratios has brought on a new postwar record increase in octane requirements.

Fairly complete data have now been compiled on hundreds of cars tested by both independent laboratories and the automobile companies. A summary of these findings in Table 1 shows the estimated octane requirements of the full 1955 line. These ratings resulted from many months of laboratory and road testing with two types of reference fuels.

They represent the over-all picture obtained from testing many cars of each model under varying driving conditions. Moreover, the tests represent the performance of cars whose engines have reached equilibrium conditions, where carbon buildup is roughly offset by flaking and removal of carbonaceous deposits. Hence, this compilation gives a truer picture of the average octane requirements of the 1955 models than did the preliminary data obtained on new cars last winter.

These final figures bear out the earlier indications on requirements of some individual makes. Regarding their relative octane demands, the figures speak for themselves. The 50 per cent columns shows the octane number which gave knock-free operation in half of the cars of each respective make tested.

Since octane requirements vary in cars coming off the same assembly lines, some show higher octane needs than others. Hence, the octane needed to satisfy 90 per cent of all cars of a particular make may be substantially higher, and the 95 per cent category includes some units which show even higher octane requirements. The 100 per cent category is not compiled because it would include that 5 per cent of cars which for one reason or another show excessively high octane demand. These top requirements are not considered indicative of the average.

At this time it is possible to arrive at a weighted average octane requirement for 1955 models, taking into consideration the basic test data and the respective production volumes of each model. These weighted figures are shown in Table 2, as compared with like data for other postwar models.

Going one step further, data have been combined on all 1955 cars with information for all postwar cars, to predict the octane quality required to satisfy any given percentage of cars on the road as of September 1955. These figures, shown in Table 3, make allowance for anticipated car scrappage and new car deliveries.

It is to be noted that all of these figures are representative of current octane requirements. Obviously, thousands of individual cars will be satisfied with octanes lower than the respective 50 per cent figures, while some will demand fuel quality greater than the 95 per cent estimates. These data however may be taken as a representative of the 1955 models in general.

The relationship between compression ratio and octane requirement also is illustrated in Table 2. Weighted average compression ratios increased from 7.41 to 7.97 this year, by far the greatest jump since the war. Weighted average octane requirements at the same time rose 4 full octane numbers to mark another postwar record.

TABLE 1—ESTIMATED OCTANE REQUIREMENTS OF '55 CARS

Make—	Compression ratio	Octane number requirement*—Primary reference fuel Oct. No. 50%	90%	95%	Commercial type reference fuel research Oct. No. 50%	90%	95%
Chevrolet 6	7.5	82	87½	89	83½	89	90½
V-8 Synchromesh	8.0	91½	96	97½	93	98	99
V-8 Powerglide	7.5	89½	93	94	91½	95	96
Ford 6	7.5	85	90	91½	86½	91½	93
V-8 Synchromesh	7.6	91	95	96½	93	97	98
V-8 Fordomatic	7.6	91	94	95	92½	95½	96½
Plymouth 6	7.4	83½	88½	90	85	90	91½
V-8 Synchromesh	7.6	87	90½	91½	90	92½	93
V-8 Powerflite	7.6	87	90	91	89½	92½	93½
Buick 40	7.5 & 8.4	91½	94	94½	92½	95	95½
50, 60, 70	9.0	94	96½	97	95	97	97½
Oldsmobile	8.5	93	96	96½	93	96	96½
Pontiac	8.0	88	92	93	90½	94½	95½
Mercury	7.6 & 8.5	92	95	96	94	96½	97
Dodge 6	7.4	88½	92½	93½	90	94	95
V-8	7.6	88	91	91½	90	92½	93
DeSoto	7.5	85½	89	90	89½	93	94
Chrysler	8.0 & 8.5	91½	94	94½	94	96½	97
Cadillac	9.0	89½	92½	93½	91	94	95
Lincoln	8.5	94½	96½	97	95½	98	98½
Packard	8.25 & 8.5	92	95½	96½	93	96½	97½
Studebaker	7.5	86	90½	91½	87½	92	93
Nash	7.2 & 7.8	84	89	90½	85½	90½	92
Hudson	7.5 & 7.8	86	90½	92	87½	92	93½

*Octane quality of fuel required for knock-free operation of percentage of new cars as indicated.

TABLE 2—OCTANE, COMPRESSION-RATIO TRENDS
(Weighted average, based on car production)

Car models—	Compression ratio	Octane requirement, primary reference fuels
1946 through 1951	6.79	82½
1952	6.96	83½
1953	7.31	85
1954	7.41	86
1955	7.97	90

TABLE 3—ESTIMATED OCTANE REQUIREMENTS FOR SEPTEMBER 1955

Per cent knock free—	Octane number requirement—50	80	90	95
1955 cars:				
Primary reference fuel octane number	90	93½	95	96½
Commercial type gasoline, research octane number*	91½	94½	96	97½
Postwar cars:				
Primary reference fuel octane number	85½	89½	92	94
Commercial type gasoline, research octane number*	87	91	93	95

*C.R.C. commercial type reference fuels which have motor octane numbers of 82 and 87 for research octane numbers of 90 and 98, respectively.

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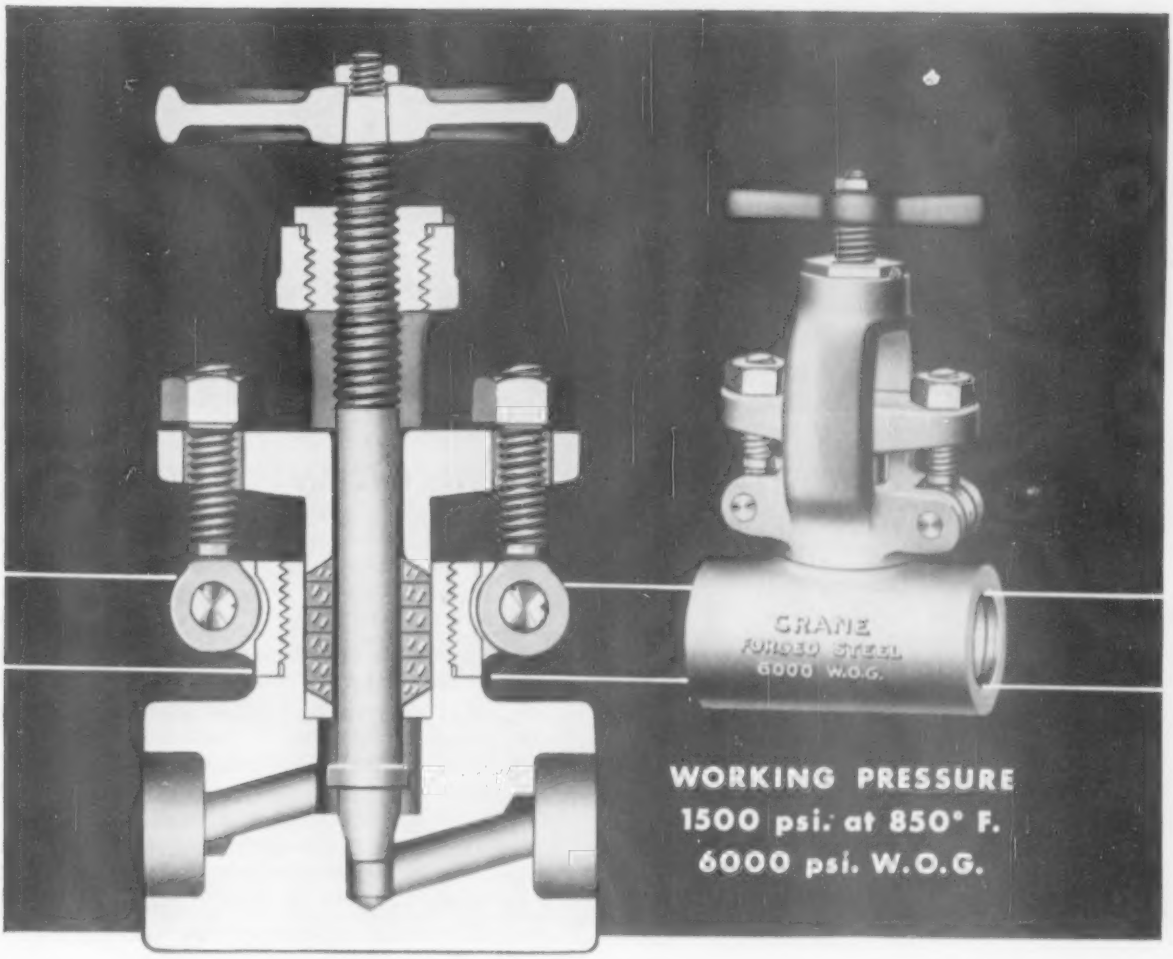

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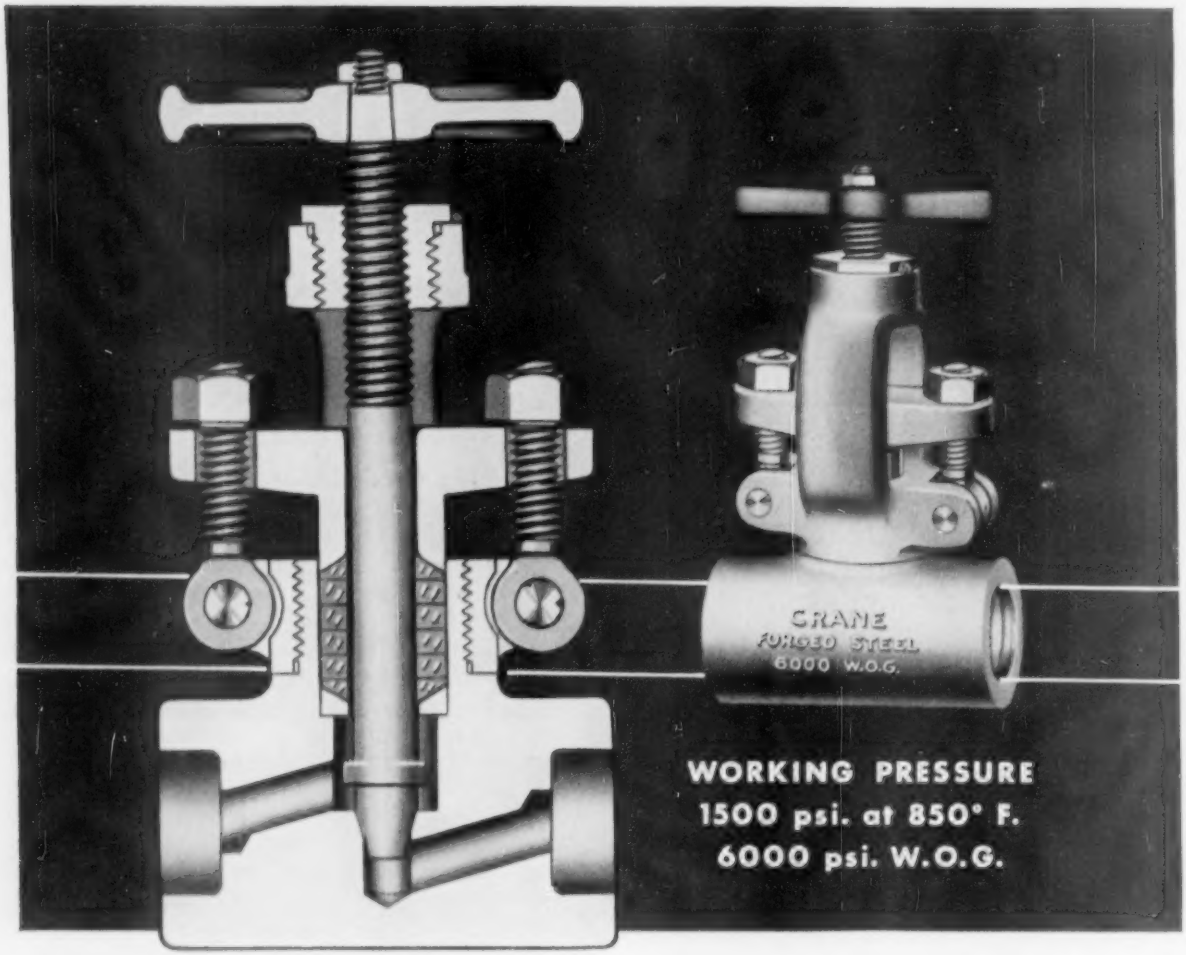

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CRANE'S FIRST CENTURY...1855-1955

ODM to Hold Hearings Soon on . . .

. . . Products Line to East Coast

WASHINGTON.—The Government is still determined to get additional overland products transportation from the gulf to the East Coast.

The problem is the kind of government aid needed to bring this about. This week, Mobilization Director Arthur S. Flemming will receive the ideas of the oil industry in an open hearing.

Texas-East Coast transportation has been under study in the Interior Department and other agencies for the past 2 years. Two plans for pipelines are now before the Office of Defense Mobilization.

. . . American Pipe Line Corp., headed by Paul Ryan, has held an ODM certificate of necessity for more than a year for rapid amortization of the cost of a line from Texas to the East Coast.

. . . Texas Eastern Transmission Corp. has Federal Power Commission approval for reconversion to products of the Little Inch pipeline. It proposes putting standby pumping capacity along the Big Inch line, for quick conversion in the event of an emergency.

Both plans call for government aid other than rapid tax amortization. Both are being fought by a group of Mississippi River barge operators. The purpose of this week's hearing is to help the ODM decide what assistance, if any, should be given, Flemming said.

"Studies have made it clear that additional transportation facilities for petroleum from Texas producing areas to northeastern market areas is in the interest of national defense," Flemming said.

"Assistance is authorized in the interest of national defense under the Defense Production Act and the Internal Revenue Code. This assistance can be in the form of rapid tax amortization, direct loans, participating loans, or loan guarantees."

Holding a public hearing is an unusual, but not an unprecedented step for the ODM. Several years ago it held a series of hearings at which officials and businessmen from a number of cities with heavy unemployment urged government help. But this will be the first hearing involving an expansion project.

Industry Briefs

NEW ORLEANS.—Crew members at Richardson & Bass 1 LL&E Humble "L" were drilling out retainers up the hole last week before going deeper in this important wildcat 35 miles southwest of here in the Mississippi Delta marshes. Operators intend to drill from present depth of 19,752 to 22,500 ft. or below, which would set a new world deep-drilling record. Several tests of promising sands at shallower depths proved noncommercial.

BORGER, Tex.—The first biennial Magic Plains Oil Exposition will be held here October 13-15 featuring an exhibit of oil industry equipment, a giant fireworks display, and a show including a bevy of movie stars. The exposition will be held on alternate years with the Permian Basin Oil Show at Odessa, Tex.

BORGER, Tex.—A 15 per cent expansion program will be launched immediately at Phillips Chemical Co.'s Plains copolymer plant near here. Present capacity is 63,000 long tons of synthetic rubber a year. The copolymer plant was purchased from the Government by Phillips along with an adjacent butadiene plant in April. The expansion will be completed by September 1956.

DENVER.—Stockholders of Swan-Finch Oil Corp., Denver, have approved a 3-for-1 stock split. Robert F. Six, board chairman and president of Continental Airlines, said shareowners approved a reduction in the par value from $15 to $5 a share and an increase in authorized shares from 1,000,000 to 3,000,000.

NEW YORK.—S.S. P. W. Thirtle, Sinclair Refining Co.'s new 25,500-ton tanker, completed her maiden voyage here last week. The vessel with 212,400 bbl. capacity and 18-knot top speed, discharged 190,000 bbl. of gasoline and heating oil from Sinclair's Houston refinery. The tanker, launched May 24 at the Bethlehem-Sparrows Point shipyard in Maryland, was the first built in American shipyards in 2 years.

SANTA MARIA, Calif.—Union Oil Co. has started doubling capacity of the sulfur plant it completed only last April in connection with a new 18,000-bbl. coking plant near here. In addition to increasing capacity to 84 tons daily, the $760,000 project includes work to control air pollution. The oil-water separators are being enclosed, and facilities being installed to recover condensible hydrocarbons and to incinerate waste gases now being flared.

Esso on the Carpet

Firm denies violating New Jersey's marketing laws

TRENTON, N. J.—New Jersey last week threatened to bar Esso Standard Oil Co. from marketing in the state.

Deputy Attorney General Andrew A. Salvest accused Esso of violating the state's motor-fuels unfair-practices act. But Esso's legal representative, F. Morse Archer, Jr., replied the company could show a completely clean bill of health.

These developments occurred during a public hearing conducted September 6 by state Motor Fuels Tax Supervisor Armand J. Salmon.

The hearing is the first to result from charges made late last year, that 12 major oil companies were granting certain dealers rebates and discounts. This first hearing, concerning Esso, was called without giving the company further particulars, and Archer said that it did not constitute fair notice and due process of law.

The law, whose constitutionality is questioned, forbids practices designed to eliminate competition. The defense hinges on the claims that discounts to retailers are made, not to eliminate, but to meet competiton. Practically every major oil company marketing in the state was asked last October to show why its gasoline distributor licenses should not be revoked for violations of the law against rebates and other practices.

They include: American Oil Co., Atlantic Refining Co., California Oil Co., Cities Service Oil Co., Gulf Oil Corp., Shell Oil Co., Sinclair Refining Co., Socony Mobil Oil Co., Sun Oil Co., The Texas Co., and Tide Water Associated Oil Co.

New Jersey is one of a few areas in the East where chronic price wars have existed for several years.

Conoco Hits in Montana

CUT BANK, Mont.—Continental Oil Co. last week made an important Madison-Mississippian oil discovery in the West Pendroy area of Teton County, Montana.

Conoco's 1 Briggs, in NW SW NW 9-26n-6w, 8 miles west of production in Pondera field, flowed oil at the rate of 4 bbl. per hour on a 36-hour test at 2,957-82 ft. The zone was acidized before test. Continental is continuing tests.

This new Madison area is on the western flank of the Sweetgrass arch of northwest Montana. It lies outside the Disturbed belt of recent discovery fame.

Rubber Output Rising

Production of former government-owned synthetic-rubber plants expected to increase about one-third during 1955

WASHINGTON.—Production of synthetic rubber will reach an all-time high this year under private operation of the former government-owned plants.

Present indications are that output will reach 950,000 tons, according to estimates of the Natural Rubber Bureau. The 1954 total was 622,852 tons.

Synthetic rubber production from petroleum-base butadiene jumped sharply after the government plants were transferred to private ownership late last April.

Output for the first 4 months was 291,919 tons this year against 214,069 tons in 1954, and increase of 77,850 tons. By midyear the increase had jumped to 125,372 tons, with output for 6 months at 431,951 tons against 306,579 tons. Production for the last half of the year is expected to be 12 per cent above that for the first 6 months.

Production on GR-S (general purpose) rubber during the first half of 1955 was at an annual rate of 735,000 tons. Estimates of large manufacturers indicate that output during the second half will be up approximately 15 per cent, giving a possible total for the year, including oil in oil-extended rubber, of 785,000 tons. Output last year was 474,219 tons. The previous high was 719,404 tons in 1945.

Butyl-rubber production is running slightly behind last year and the 1955 output is estimated by the bureau at 55,000 tons against 58,987 tons in 1954.

More neoprene and N-type rubber also will be produced this year. Output of neoprene is expected to reach 85,000 tons against 69,150 tons last year, and N-type 25,000 tons against 21,396 tons.

The bureau estimates that 13,000 tons of synthetic rubber will be imported this year, 12,000 tons of it GR-S and the rest butyl.

Exports will include 33,000 tons of GR-S, 16,000 neoprene, 10,000 butyl, and 4,000 N-type, for a total of 63,000 tons. This will leave 900,000 tons of synthetic rubber available for domestic consumption. Last year, imports were 16,900 tons and exports 30,117 tons, leaving a domestic supply of 609,635 tons.

Rotary Table Up in the Air

This 59-ton sign above the new 21-story office building being built for Continental Oil Co. and Texas National Bank in Houston is turned by a rotary drilling table. The big rotary table, built by Brewster Co., Inc., revolves twice per minute. It is believed to be the first ever used for such a purpose. In case of a hurricane, the sign, which is nearly 60 ft. high, stops revolving. The globe, made of translucent plastic about ½-in. thick, serves as a "weather eye." Alternating colors give Houstonians a daily weather forecast. The globe is 15 ft. in diameter and about 400 ft. above the sidewalk. It is stationary and designed to withstand 120-m.p.h. winds. Conoco employes from three other buildings have started moving into the new headquarters. The move, involving some 450 workers, is scheduled to be completed about October 1.

Dual Pay Possible

Reagan County well gets good Ellenburger flow

RANKIN, Tex. — Flush Ellenburger production with possibility of a second pay zone in the Fusselman has been established at a wildcat in central Reagan County.

The discovery is Phillips Petroleum Co. and Southland Royalty Co. 1 Zulette, 5 miles east and slightly south of Stiles.

Geological location is on the southern part of the Midland basin in West Texas. High-gravity oil, heavy flowing pressures, high gas-oil ratio and other aspects of the discovery are similar to Ellenburger wells in the big Barnhart field in southeastern Reagan County.

Potential test of the Ellenburger at 10,532-54 ft. was 543 bbl. of 58.6° oil a day. The gage was through 18/64-in. choke, with gas-oil ratio of 3,300:1 and flowing tubing pressure of 1,650 psi. An earlier test of the Fusselman flowed oil, but operators had not decided upon dual completion at this time.

Completion of the well as a heavy Ellenburger producer came as a surprise since the well failed to show for commercial production on drill-stem tests of that formation. First indications of a producer from the Ellenburger came after treating with 500 gal. of mud-acid. In 12 hours the well flowed 83 bbl. of distillate. When turned through separators, the high gas-oil ratio of around 11,800:1 froze the separators in 2 hours and shut the well in.

History of Barnhart-Ellenburger field is that wells there showed very low porosity and permeability, with solution gas drive as source of energy. Amerada Petroleum Corp.'s discovery well of Barnhart field flowed 1,122 bbl. of 45° oil, with gas-oil ratio of 2,140:1.

Big Gas Line Nearer

St. Laurent indicates dominion approval of Trans-Canada is due soon; start of construction next spring possible

OTTAWA. — Trans-Canada Pipe Lines, Ltd.'s big-inch gas line looks as if it's a step nearer construction. Just how big a step is not definite. It could be a man-sized stride if things work out as planned.

It appears likely the Canadian cabinet will approve a revised plan for the line. This proposal includes the all-Canadian route and a leg swinging from Emerson, Man., to near Nashville, Tenn. Tennessee Gas Transmission Co. would build the Emerson leg to deliver 200 million cubic feet of gas daily to U. S. markets *(The Oil and Gas Journal, August 8, page 55).*

Federal approval of the project could mean the way is paved for financing the $350-million line. It also could erase some of the problems connected with signing up gas producers in Alberta and consumers in eastern Canada.

But Trans-Canada still has some big problems ahead. These include:

. . . Federal Power Commission approval of T.G.T.'s plans to buy Alberta gas at Emerson and sell gas to Trans-Canada at Niagara, N. Y.

This may be the biggest hurdle facing the project. T.G.T.'s 1,000-mile line proposed from Emerson would cut through the Great Lakes marketing area, which is served by several big U. S. transmission companies. The Alberta gas would be moving into a market area served by more-expensive Gulf Coast gas.

. . . Closing a deal with the Ontario Government for the province to help finance that portion of the line running across the province from Winnipeg.

The latest developments on the controversial line came after a 2-day meeting here of government and pipeline officials. Prime Minister Louis St. Laurent announced following the session that dominion approval of the project is likely.

What's new . . . St. Laurent said a new plan for the line will include the formation of a crown corporation to build the Ontario section. This section would be financed by the federal and Ontario governments at an estimated cost of $150 million. The line would be leased to and operated by Trans-Canada.

Finance Minister Walter Harris has been the strongest cabinet opponent to government assistance in financing the line. But Harris appears ready to go along with the new plan.

When an earlier plan for the line was developed, one of the major producers in Alberta refused to sell to the line if any portion was owned by the government. The leasing arrangement in the new plan may sidestep this opposition.

Present plans . . . According to a plan outline by the prime minister, the line would be built in three sections. Two would go into operation about October 1956.

These two sections would be the Alberta - Winnipeg - Emerson section, which would deliver about 230 million cubic feet of gas daily, and the Toronto-Ottawa-Montreal section, which would deliver about 90 million cubic feet daily.

Sometime near the end of 1957, the Ontario section would be completed, giving Canada a 2,220-mile line capable of delivering 500 million cubic feet of Alberta gas to eastern Canada.

One thing Trans-Canada must do is give the FPC assurance it can deliver 200 million cubic feet of gas daily at Emerson for sale to T.G.T. This phase of the project is expected to come before the FPC sometime within the next 2 or 3 months.

Markets . . . Before any financing is completed, Trans-Canada must come up with more markets for its gas.

In addition to taking gas at Emerson, T.G.T. has agreed to take any surplus gas at Niagara. This gas would go into T.G.T. system throughout New England and the New York metropolitan area.

Trans-Canada has sales contracts with Winnipeg & Central Gas Co., Union Gas Co. of Canada, Ltd., whose system covers southwestern Ontario, and Quebec Natural Gas Co. Consumers' Gas Co. of Toronto is now buying T.G.T. gas, but is expected to switch to Trans-Canada gas when the line is completed.

Those attending the meeting here in addition to the prime minister and finance minister were Trade Minister C. D. Howe; N. E. Tanner, Trans-Canada president; Charles Coates, Trans-Canada general manager; Premier E. C. Manning of Alberta; I. M. McKinnon, head of the Alberta Gas Conservation Board; Edward Loughney and Alex Bailey, both of Calgary, representing the gas producers; and Ralph Will and William Knode, both of Alberta Gas Trunk Line Co., the firm that will gather the gas in Alberta.

Owners Approve Merger

TORONTO.—Shareholders of Anglo-Canadian Oil Co., Ltd., have approved an offer to merge with Canadian Oil Companies, Ltd.

Canadian Oil will exchange one-seventh share of its own stock and $2.75 in cash for each share of Anglo-Canadian, whose assets were valued at $23 million.

The purchase will make Canadian Oil a fully integrated company. The firm already is considered one of the fastest-stepping oil-refining and marketing firms in Canada. The purchase will add 13 million barrels of oil reserves in western Canada and an experienced producing organization built up by Anglo-Canadian.

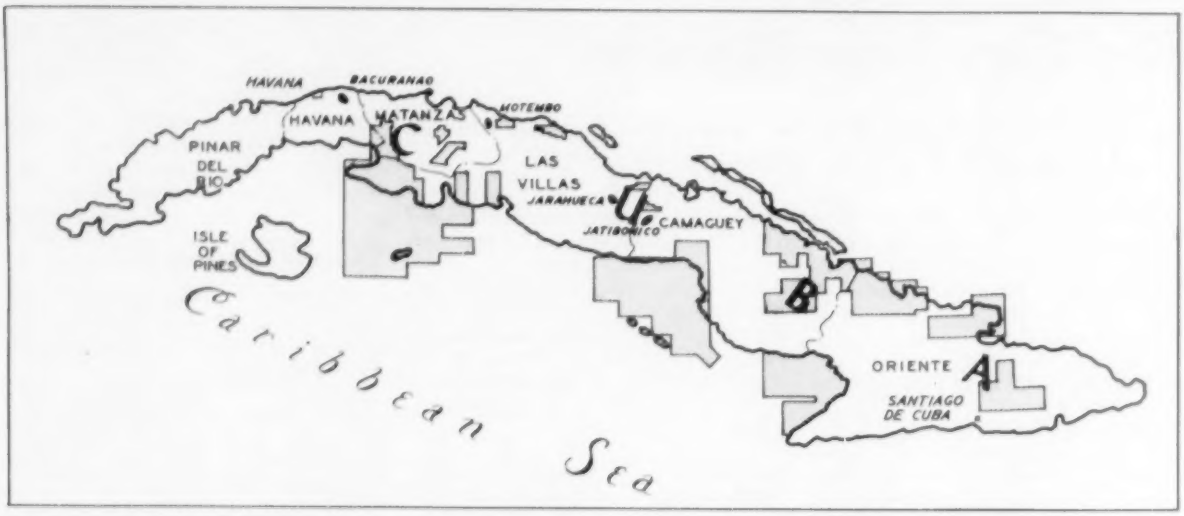
The Anglo-Canadian company held interest in more than 175 producing wells and in various gas reserves in Alberta. The company has acreage interests in Alberta, Saskatchewan, Montana, North Dakota, and Wyoming.

Canadian Oil has a 23,000-bbl. daily refinery at Sarnia currently undergoing an expansion, owns a grease plant at Montreal, a blending plant at Toronto, and storage terminals in eight Canadian cities.

Canadian Briefs

VANCOUVER.—Hudson's Bay Oil & Gas Co. paid a record bonus of $432,629 for a lease on 444,206 acres of land in the vicinity of the Peace River gas field in northern British Columbia. The acreage is about 80 miles northwest of Fort St. John. Six other bids were submitted. Hudson's Bay is jointly owned by Continental Oil Co. and Hudson's Bay Co. of Canada.

VALLEYFIELD, Que. — National Silicates, Ltd., Toronto, will build a sodium silicates plant here adjacent to a synthetic cracking catalyst plant Davison Chemical Co. is building. Construction of the National Silicates plant will start next spring. Most of the output will go to the Davison plant. Davison Chemical is a subsidiary of W. R. Grace & Co.



SHADED AREA represents 12,000,000-acre concession on which Stanolind will explore for oil in Cuba.

Exploration Gets Big Boost as . . .

. . . Stanolind Signs Cuban Deal

Gene Kinney

CUBA'S exploration boom got its biggest shot in the arm last week when Stanolind Oil & Gas Co. signed a contract with two Cuban firms for rights on 12 million acres in concessions.

Stanolind President E. F. Bullard announced exploration would begin immediately on the concessions held by Cia. Petrolera Trans Cuba, S.A., and Cuban-Venezuelan Oil Voting Trust, a 24-company combine formed to comply with Cuban land laws. Individual concessions are limited to 741,300 acres.

Stanolind could earn half interest in the concession by spending $10,000,000 over the next 5 years. The Tulsa-based company negotiated with the Cubans for several weeks before agreeing to terms *(The Oil and Gas Journal, July 25, page 144).*

The deal, giving Stanolind rights on an area equivalent to almost half the island's entire acreage, boosts the investment in the search for oil in Cuba to some $25,000,000. The whole island, as well as millions of acres of tidelands, is covered by concessions and claims *(The Oil and Gas Journal, August 22, page 88).*

The map spotting Stanolind's acreage shows the company is gambling heavily that Cuba's oil future lies in the thick Tertiary basins along the southern coast. The concession is scattered in a dozen blocks over Matanzas, Las Villas, Camaguey, Havana, and Oriente provinces, but most of the area is offshore and has not been tested by the drill. The offshore portion extends as much as 40 miles out to sea. The water is very shallow, generally no more than 50 ft. deep and usually much less.

Stanolind's exploration program is the biggest in Cuba's 90-year-old history, which began a new phase in May 1954 with the discovery of Jatibonico field in Camaguey.

One of Stanolind's big blocks lies about 30 miles south of the field, the first on the island to produce from nonserpentine, sedimentary rocks and on the south slope. Production of 1,000 bbl. daily comes from around 1,100 ft.

Contract terms . . . Stanolind, a subsidiary of Standard Oil Co. (Ind.), must spend at least $2,000,000 on exploration and drilling by January 1, 1957, to keep the agreement alive.

The company has the option of continuing the agreement, during each succeeding year, by investing $2,000,000 in the search for oil, or drilling 40,000 ft. of exploratory hole.

The contract provides that Stanolind will receive half interest in the concession if and when total expenditures reach $10,000,000. The company will retain half interest in any producing well drilled and half interest in the surrounding 80,000 acres.

The Cuban companies will release Stanolind from the contract at any time, in which case an undisclosed penalty is to be paid.

Stanolind will be operator of all jointly owned properties developed in the program.

No bonus involved . . . No cash consideration was involved in the deal, Stanolind said.

The first step toward exploration drilling will be to make aerial photographs of the acreage. Surface geological studies will follow, based on the photographs. Geophysicists will then conduct extensive seismograph and magnetometer surveys.

All this must be done before the first well is spudded in.

Heretofore Stanolind has largely confined its operations to the United States, ranking among the top five domestic producers. One of the major developers of prolific Pembina field in Alberta, Stanolind's only foreign operation is in Canada.

The background . . . The Stanolind acreage is part of some 16,000,000 acres controlled by C.V.O.V.T., headed by Warren W. Smith, former president of Pantepec Oil Co., and Trans Cuba, whose president is Viriato Gutierrez, Cuban sugar magnate.

Trans Cuba gained half interest in C.V.O.V.T.'s original concession, the biggest in Cuba, by agreeing to spend

(Continued on page 101)

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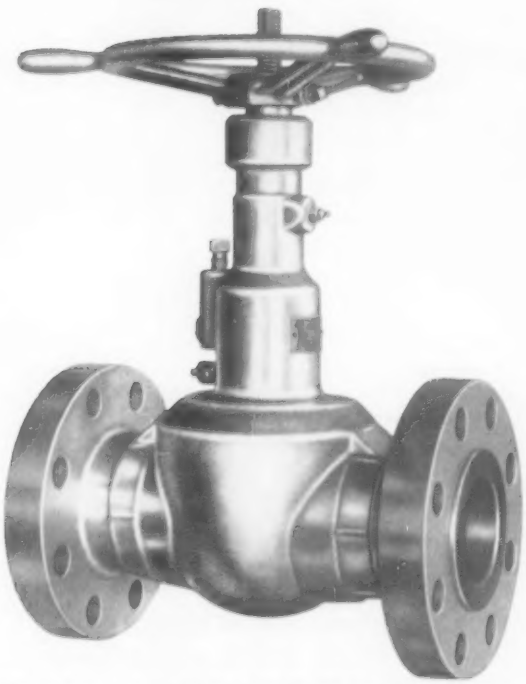

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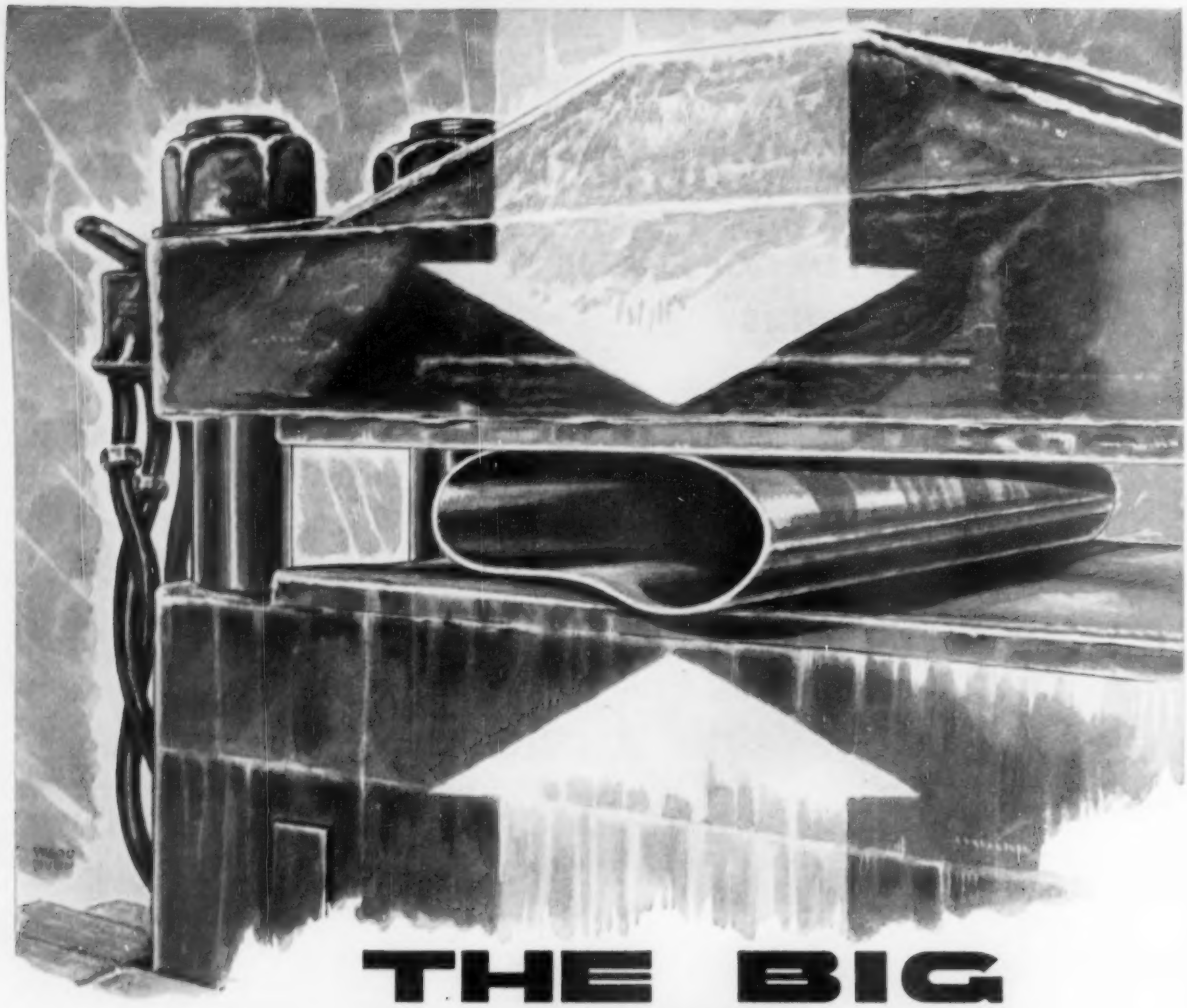

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$3,000,000 on exploration. Part of the acreage retained by the Cubans lies just south of Jatibonico. Trans Cuba has drilled three dry holes there and has started a fourth well 4½ miles to the west of its Sancti Spiritus 1, which cut some 10,000 ft. of soft Tertiary sediments before being abandoned last month.

This was the first confirmation of the existence of such thick sediments, and geologists are betting that any major oil discovery on the island will be made here or in a similar basin along the southern coast.

However, there are plenty of supporters for the north, where exploration centered before the Jatibonico discovery and where concessions are held by such companies as Standard Oil Co. (N. J.), Royal Dutch-Shell, Gulf Oil Corp., Atlantic Refining Co., and Standard Oil Co. of California.

Although some 2,000 wells have been drilled in Cuba, production outside Jatibonico amounts to only 200 bbl. per day, coming from three shallow depleted fields.

Turkey to Get Oil

Iraq to pay old debt in oil under tentative pact

TURKEY, in trouble with her oil suppliers, may get oil from Iraq and collect at the same time an old debt that dates back to the Ottoman Empire.

Officials of the two countries last week had apparently ironed out the preliminary details of a plan by which Iraq could pay off a debt of 100,000,000 Turkish pounds ($35,750,000) in oil shipments by installments.

The debt is a part of Turkey's claim on Iraq oil that dates back to the days when Iraq was Mesopotamia and Turkey controlled the country as part of the Ottoman Empire, which was broken up at the end of World War I.

Reports from Istanbul last week indicated that the oil payments may be part of an agreement for increased trade between the two countries. The agreement reportedly was reached at the conclusion of long negotiations between the two countries.

If the plan does go through, it will give Turkey the oil she needs badly. At the present time, international oil companies will sell oil to Turkey on a "cash only" basis.

She has defaulted on credit payments of some $40,000,000 to Socony Mobil Oil Co., Inc., Caltex, Royal Dutch-Shell, and British Petroleum Co. marketing subsidiaries. Turkey owes the bulk of that sum to Socony Mobil.

Cape Range Studied

Seismic survey being made in Western Australia

DETAILED seismic work is under way in the vicinity of the Cape Range structure of Western Australia.

The survey follows the recent shutting-in of West Australian Petroleum Pty. Ltd.'s Cape Range No. 1A after 5 weeks of tests. The study will encompass the wells already drilled as well as other points along the structure.

WAPET, owned 20 per cent by Ampol Exploration, an Australian company, and 80 per cent by Caltex, has drilled 7 wells in Rough Range. Five stepouts drilled around the discovery were dry.

The latest well, a 30-ft. offset, found oil at 3,605-20 ft., the same horizon tapped by the discovery in November 1953. During tests of 1A, about 16,900 bbl. of crude and 3,690 bbl. of water were recovered. Oil flowed at an average rate of 400 bbl. daily through a ¼-in. choke. But indications were that oil in the reservoir was not being replaced at nearly that rate. Water encroachment became marked as the tests proceeded.

Two other WAPET deep tests are drilling forward. Cape Range No. 2, about 25 miles north of Rough Range, has passed 10,531 ft. Grant Range has passed 11,920 ft.

Oil Hunt Termed Failure

South Africa's geological survey division has called the government-sponsored oil search a failure, and at the same time has shaken a warning finger at those who might wish to explore further.

The negative results were revealed in a report to the secretary of mines by Dr. L. T. Nels, director of the survey, in announcing the failure, Dr. Nels also discouraged future prospects, saying:

"Although the results obtained appear to rule out the areas investigated as likely sources of mineral oil, they nevertheless have positive value. Much money has been spent fruitlessly in the past by private enterprise in a spirit of optimism. It is to be hoped the results obtained will discourage future waste of private money and energy."

The Union's oil exploration program was organized in 1929 as part of its war effort. High points of the search included eight deep tests, seven in Cape Province and one in Orange Free State, between 1944 and 1946. A seismic survey of the Zululand coastal belt was undertaken in 1951. Most recent of the survey activities was a test well drilled near Dannhauser, Natal, as a result of an oil seepage found in the Durban Navigation Colliery.

Firms Eye Guatemala

Five U. S. majors seeking permits for test drilling

FIVE U. S. companies have applied for permits to test drill in Guatemala, but indications are that any wildcatting activity will not get under way until next year.

Companies interested in the permits are Conorado Oil Co., Standard Oil Co. of California, Union Oil Co. of California, The Texas Co., and Sloan Investment Co. of New York.

Actual permits cannot be issued for 2 months under Guatemala's new petroleum law which became official August 8. Regulations governing administration of the law will be written within 60 days.

An official of one company applying for a drilling permit said the move was routine to keep his firm in a position to act if conditions should become more favorable in Guatemala.

Oil companies interested in foreign operations generally were disappointed by Guatemala's new law and indicated they would spend their exploration dollars in other foreign developments *(The Oil and Gas Journal, August 1, page 76)*.

Should any test drilling permits be issued this fall, actual drilling would have to await end of the rainy season this spring. Most surface exploration in Guatemala has centered in the Peten Province and in the area surrounding Lake Isabal near the Caribbean coast.

Panama May Get Oil Play

Cia. Petrolera, S.A., a subsidiary of Union Oil Co. of California, may shift its operations across the border into Panama if its current wildcat in Costa Rica should prove dry.

The exploratory well is the 1 Bris and was drilling at 1,585 ft. last week. It is about 22 miles from the Caribbean coast of Costa Rica near the Panama border. Two previous wells were abandoned at 10,000 ft.

Joel Lloyd, general manager of Cia. Petrolera, said the 1 Bris, however, is on an entirely different structure than the two dry wells. The structure extends into Panama and that may prompt the company to move into Panama.

Union holds a 40-year concession from Panama in the Boco del Toro Province bordering Costa Rica on the Caribbean coastal area.

Iraq Line Expanding

Throughput has jumped 67 per cent since 1952 due to big demand in Europe; but Syria is demanding higher royalty

DEMANDS by Syria for increased royalties on oil transported across its borders have centered attention on the growing importance of Iraq Petroleum Co., Ltd.'s, pipeline system.

The line's throughput has been increased to where it now carries around 500,000 bbl. daily of crude from Iraq fields to the Mediterranean terminals at Banias, Syria, and Tripoli, Lebanon. The bulk of this crude is helping meet rapidly expanding demand in Western European countries.

Last year, about 97 per cent of the crude delivered from the pipeline terminals was sent to six countries in Western Europe. The bright prospects for higher consumption in Western Europe and the increasing shipments there over the past 3 years foreshadow continued expansion of the system.

With bright prospects ahead for the pipeline system, Syria is pressing I.P.C. for higher transit fees.

Talks between the government and I.P.C. have dragged on for several years. As long ago as 1953, Syrian officials had asked for 49 per cent of the net profits derived from lines crossing the country. But negotiations seemed headed for a climax when the Syrian Parliament recently urged the government to favorably conclude an agreement sometime this month.

Figures released . . . Detailed figures on shipments and countries of destination have been made public for the first time by the Iraq Government in its recently published 1954 statistical abstract (see table). The report shows that between 1952 and 1954 throughput increased 9,687,689 long tons, approximately 200,000 bbl. daily.

The biggest increase came between 1952 and 1953 when throughput jumped from 14,550,966 tons to 23,122,864 tons, or 59 per cent. In 1954, line shipments, not including crude taken off in Syria or Lebanon, totaled 24,238,649 tons.

France has been the biggest user of crude from the line. Last year, France received about 39 per cent of crude shipments. Next ranking countries of destination were Italy, 25 per cent; United Kingdom, 17 per cent; Germany, 7 per cent; Holland, 5 per cent; and Belgium, 4 per cent.

Shipments to the United States from the pipeline ports totaled 180,869 tons in 1954, less than 4,000 bbl. daily. In 1953, shipments to the U. S. totaled 116,775 tons, and in 1952 were 119,651 tons.

Pipeline system . . . To meet anticipated growth, I.P.C. has planned a 24-in., 75-mile line from Homs, Syria, to Tripoli. It would handle up to 180,000 bbl. daily made available by the addition of two pump stations on the existing 30-in. trunk *(The Oil and Gas Journal, May 23, page 98)*.

Crude Exports Through I.P.C. Pipelines

(In long tons)

	1954	1953	1952
Total crude shipped from Iraq	24,733,857	23,888,597	15,582,896
To Jordan	462	528	1,741
To Syria and Lebanon	580,080	575,455	570,698
Total	580,542	575,983	572,439
Shipments of Iraq oil from Syria and Lebanon to:			
France	9,454,508	8,537,655	5,574,545
United Kingdom	4,231,939	5,513,284	3,758,304
Germany	1,581,551	1,467,410	1,062,079
Italy, including Trieste	6,120,533	5,340,596	2,608,101
Belgium	915,035	866,574	835,013
Yugoslavia	394,530	418,979	356,647
Holland	1,153,249	664,744	49,150
Canary Isles			102,518
United States	180,869	116,775	119,651
Portugal	181,066	13,930	43,464
Sweden	11,573	74,091	41,494
British West Indies		60,124	
Spain	13,796	48,702	
Total	24,238,649	23,122,864	14,550,966

Note: Differences between the total input and output of the lines is due to crude held in storage at terminals or in transit at year's end.

I.P.C.'s Eastern Mediterranean system consists of twin 12-in. and 16-in. lines and a 30-32-in. line. The lines lead from Iraq's Kirkuk field with a connection to smaller producing areas in northern Iraq operated by Mosul Petroleum Co., Ltd. The 30-32-in. line carries crude to Banias. One set of 12 and 16-in. lines goes to Tripoli. The other set and an incomplete 16-in. line leads to the Haifa refinery, Israel. This line has been out of service since the Arab-Israel war of 1948.

Mexican Output Up

President Cortines cites progress during past year

PRES. ADOLFO RUIZ CORTINES painted a picture of progress in Mexican oil last week in his address to members of the new Mexican Congress.

The president said that Mexican crude production has averaged about 245,300 bbl. daily during the past 12 months. This compares with a daily average of 233,000 bbl. the previous year.

In addition, Cortines said natural gasoline and field-distillate production by Petroleos Mexicanos, the official government oil company, raised total output to 250,400 bbl. daily.

The Mexican president said his country's combined oil and gas reserves (in which natural gas is reduced to its liquid equivalent) increased 446,100,000 bbl. for the last year, bringing total reserves to 2,758,300,000 bbl. Gas accounts for 23,400,000 bbl. of that figure.

He said Pemex drilled 354 wells in the past 12 months. There were only 92 dry holes for a success ratio of some 74 per cent. Cortines said wildcatting resulted in discovery of 11 new fields.

Jordan Agreement Reached

Preliminary drafts have been completed on an agreement giving American oilman Edwin W. Pauley a concession to drill for oil in Jordan.

Pauley's son, Edwin W. Jr., spent last week here negotiating with Jordan government officials in behalf of his father. He held an interview with Jordan Premier Said El Mufti just before flying back to the United States.

Pauley took the drafted agreement with him to the U. S. It will be drafted into legal form. Jordan Economic Minister Said Aladin termed the agreement the best ever concluded in the Arab world for oil exploration. He added he expected the contract to be signed finally here within the next 3 weeks.

New Offshore Work

First submersible barge to drill off Trinidad

A SUBMERSIBLE drilling barge, believed to be the first ever used in South America, will start work this week off the coast of Trinidad.

It will be used in an extensive drilling program for Antilles Petroleum Co. (Trinidad) Ltd., in the Point Ligoure area of the Gulf of Paria. Antilles is a wholly owned subsidiary of McColl-Frontenac Oil Co., Ltd., which is controlled by The Texas Co.

First well from the new drilling barge will be about 3,000 ft. off Ligoure. The company previously explored part of the submerged area by directional wells sunk from the shore.

Wells drilled from the barge will be under water about 20 ft. deep, between Trinidad and Venezuela.

Another company, Trinidad Northern Areas, Ltd., conducted the first drilling off the coast of Trinidad. This company started drilling from a platform erected in the Cedros Point area about 1 year ago.

Southeastern Caribbean Drilling Co., C.A., is owner of the barge to be used in the Antilles program. Levingston Shipbuilding Co., Orange, Tex., built the vessel, which was towed to the drilling site by ocean-going tugs *(The Oil and Gas Journal, August 8, page 77).*

Spanish Project Bids Due

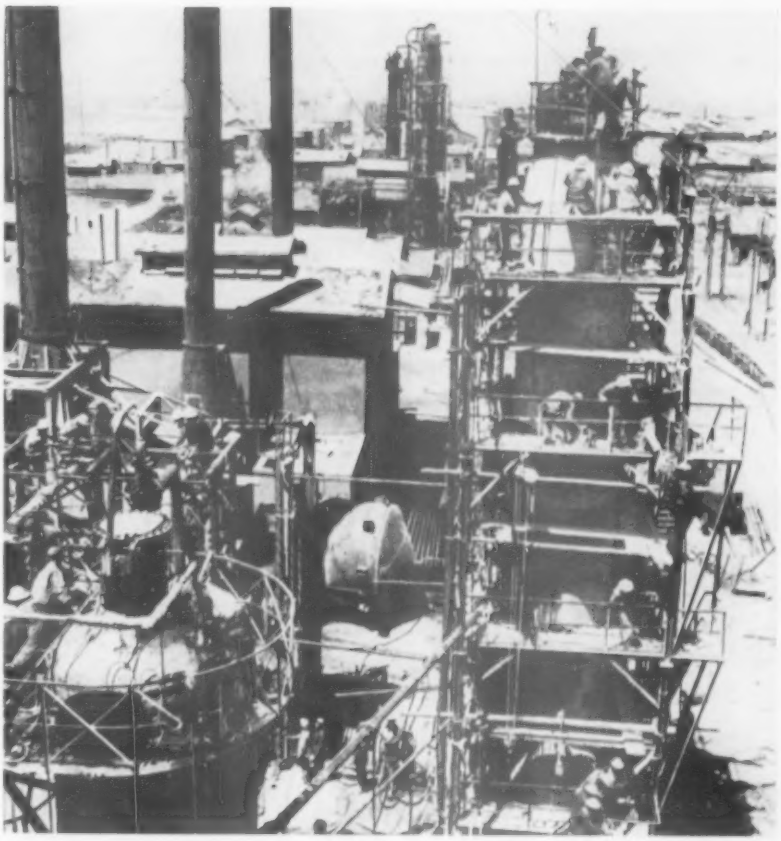
Brown-Raymond-Walsh, prime contractors for the 485-mile military pipeline to serve U. S. airbases and military installations in Spain, will ask for bids on construction of underground storage tanks and distribution systems.

Plans and specifications for the construction at Rota, Moron, Torrejon, and Zaragoza are now being prepared. Principal pipeline construction is a joint venture of Brown & Root, Inc., Houston; Raymond Concrete Pile Co., New York; and Walsh Construction Co., Davenport, Iowa. The contractors said last week bids will be accepted only from established American firms.

Bidders must have done comparable work within the past 3 years.

Construction will involve excavation of holes up to 30 ft. deep, laying concrete base slabs, tank erection, and backfilling.

The storage is part of the pipeline project linking the Atlantic seaport of Rota and five bases now under construction in Spain. It will cut diagonally across the Spanish peninsula from Rota to northwest of Zaragoza, site of a big U. S. bomber base *(The Oil and Gas Journal, June 27, page 66).*



Red China's Version of Refinery Construction

This photo released in this country last week by the Eastfoto agency shows crews working on units of a refinery in the Yumen oil field, about 800 miles due west of Peiping. Chinese Government news agencies a year ago announced that this plant was being enlarged to produce "one-third more gasoline and kerosine," but no capacity figures were given. At that time new equipment for the plant was to include visbreaking still (apparently the unit in the foreground), a crude-distillation tower, pumps, heat exchangers, and pipelines.

International Briefs

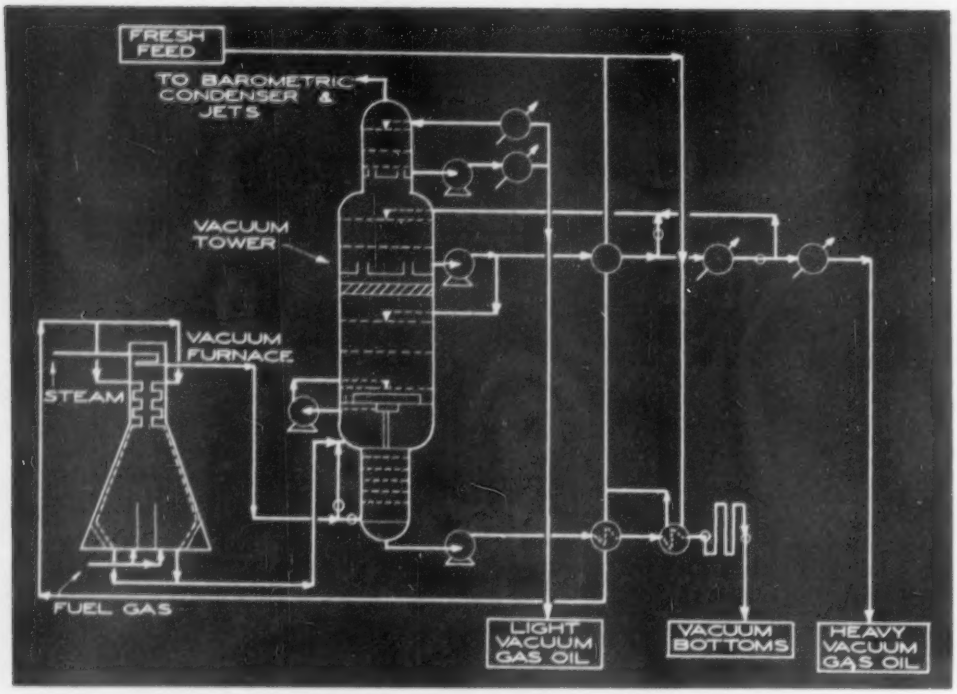
The Japanese trading firm of Idemitsu Kosan Co. will purchase about 1,500,000 bbl. of crude and 350,000 bbl. of products from National Iranian Oil Co. during the last 4 months of this year. The oil will be a portion of royalties on one-eighth of the consortium production, which the Iran Government can take either in cash or in kind.

Wildcat wells in the lower Po River Valley will be started soon by Azienda Generale Italiana Petroli, owned by the Italian Government. Rigs are being set up at Codigoro and Casiglia, near Ferrara.

Australasian Petroleum Co. Pty., Ltd., is preparing sites for two more test wells in Papua, New Guinea. The wildcats will be drilled in jungle area near the border of Netherlands New Guinea. A well under way, 1 Aramia, has passed 5,500 ft. The operating company is owned by Vacuum Oil Co. Pty., Ltd., D'Arcy Exploration Co. (British Petroleum), and Oil Search, Ltd., an Australian firm.

French oil companies, banks, and trusts will set up a new company for exploration and production in the Guyenne and Quercy areas of southwestern France. Participants will include Pechelbronn, Shell Francaise, Cie. Francaise Des Petroles, Bureau de Recherches du Petrol, Ofirep, and Finarep.

Philippine Oil Development Co. expects to begin drilling operations in the Cagayan Valley of northern Luzon by the end of October. Andres Soriano, president of the local Philippine company, said that drilling equipment has been brought to the area.



PROCESS FLOW DIAGRAM for Cities Service vacuum unit, Lake Charles refinery.

Vacuum Unit Steps Up Cat Feed Quality

. . . while it also increases plant flexibility and sharply reduces production of No. 6 fuel oil for Cities Service

by William J. Burch

INSTALLATION of a vacuum unit at the Cities Service refinery at Lake Charles, La., has brought about these results:

- A considerable increase in the operating flexibility of the refinery.
- Cat cracking feed has been improved in quality and quantity.
- Production of residual No. 6 fuel oil has been materially decreased.

The No. 6 fuel-oil production was reduced by 1.0 per cent based on crude charge and the cat cracker feed was increased by 1.0 per cent based on crude charge. The quality of the cat cracker feed was improved by the reduction of 57,000 lb. per day of Conradson carbon. This is equivalent to 3,800 bbl. per day of catalytic cracker capacity.

The operation of the cat crackers was also improved by the reduction of metallic contamination (which results in catalyst poisoning) which is normally carried with carbon residue in the cat feed.

Author is process engineer, Cities Service Refining Co., Lake Charles, La.

Capacity bottleneck . . . As refinery crude runs were increased from the 70,000 bbl. per day initial refinery design to the present rated capacity of 175,000 bbl. per day, one of the major problems encountered with the processing of increased quantities of reduced crude from topping operations.

Refinery crude runs were, in general, limited to the capacity of the propane deasphalting unit ever since operations started in 1944. This deasphalting unit is rather unusual in that it was the first commercial propane deasphalting unit installed for the production of catalytic cracking feed stock.

The deasphalting unit was designed to process 14,250 bbl. per day of reduced crude for the separation of heavy virgin gas oils from asphalt, and was chosen over the conventional vacuum flash unit due to the quality and yield requirements of the three Cities Service refinery's fluid catalytic cracking units. Production of reduced crude, as a result of increased crude runs, was limited to the capacity of the deasphalting unit.

The first major capacity increase occurred in 1949 when Cities Service started supplying feed to a new lube plant. The processing of large quantities of reduced crude in the lube plant unloaded the deasphalting unit to the point where it could again operate at near design capacity. Experience gained at a high-level operation of the deasphalting unit suggested that processing of extraneous feed stocks, in addition to the reduced crude, could be profitable.

Vacuum unit added . . . Refinery crude runs were again increased to the point where the deasphalting unit was fully loaded and crude runs were again limited. In 1954, the second and final step for handling reduced crude was provided when a new, modern, 26,750-bbl. per day vacuum unit was put on stream. This vacuum unit was designed to operate as an intermediate step between the topping units and the deasphalting unit, and thereby reduced the charge requirements of the latter to within the unit capacity.

The new vacuum unit and the deasphalting unit permit efficient handling of reduced crude at the 175,000-bbl. per day crude level and in some cases permit processing of extraneous feeds through the deasphalting unit. It has been recognized in deasphalting practice that a heavier narrow-boiling-range feed stock is more desirable from the standpoint of efficient propane deasphalting than the wide-boiling-range feed stock.

This fact had an important bearing on the selection of heavy-oil processing facilities. Thus by utilizing the vacuum unit for primary separation and the deasphalting unit for final separation of catalytic feeds from asphalt, the most economic operation resulting in maximum yield of quality feed for catalytic cracking was obtained. It was indeed a novel approach to an old refinery problem inasmuch as the conventional refinery has utilized the vacuum flash and in some cases added a deasphalting unit as a second step.

The deasphalting unit operation was previously described by C. W. Kraemer, thermal department superintendent, in the March 30, 1946, issue of The Oil and Gas Journal.

Design basis . . . The design of the vacuum tower was based on the production of 10,000 bbl. per day of low-carbon-residue sidestream product and 16,760 bbl. per day of bottoms product of 14.5° A.P.I. The latest thinking on gas-oil product quality improvement was incorporated in the design of the tower. Vapor and liquid feed enter the tower and are subjected to a centrifugal and slightly downward motion imparted by the velocity head.

Two sets of hot reflux streams, one "clean" and one "dirty," are utilized in the lower section of the tower to provide vapor liquid contact for "scrubbing," the vapors. Finally, a woven mesh, located directly below the heavy-vacuum gas-oil pan acts as an entrainment separator and affords final vapor cleanup.

Flow Plan

A blend of reduced crudes, from both sweet and sour crudes, enters the unit at about 200° F. This charge is picked up by the feed pump the discharge of which splits into two streams to facilitate the primary preheat in two banks of exchangers. One stream enters the intermediate reflux bank and the other enters the vacuum-tower-bottoms exchanger.

The reduced crude is recombined at outlet of these two low-temperature-level exchanger banks and receives final preheat in two more vacuum-bottoms high-temperature-level exchangers.

The preheated oil again divides into two streams and enters the vacuum furnace where the charge is heated to flash temperature. A little steam is injected into the furnace inlet lines to increase velocity in the tubes and decrease the tendency to form coke.

Tower operation . . . The flashed or vaporized portion of the vacuum-tower feed plus steam present in the furnace charge and stripping steam from the base of the tower pass up the tower into the condensing section. Conditions in the upper portion of the tower are such that the condensation of the vaporized feed takes place. The uncondensable gases and steam pass overhead into the vapor line.

Two distillate cuts are obtained: heavy vacuum gas oil and light vacuum gas oil. The former product, combined with hot and intermediate reflux, is withdrawn from the lower pan by the heavy-gas-oil reflux product pump. Discharging from this pump, a portion of the product is returned hot to the No. 6 tray of the vacuum tower and the remainder is heat exchanged with a portion of the incoming reduced-crude charge as previously mentioned.

The combined intermediate reflux and net gas-oil product stream receives additional cooling in the intermediate reflux cooler at the outlet of which a portion of the stream is returned under flow control to No. 4 tray of the vacuum flash tower. The net heavy-gas-oil product receives final additional cooling before being routed to storage.

The light-vacuum gas-oil product combined with the circulating reflux (top-tray reflux) is withdrawn from the pan between the third and fourth trays of the vacuum tower by the light-gas-oil pump. The stream is then water cooled after which the net product is routed to the battery limits under control of the level in the light-gas-oil pan. The remainder of the stream is returned to the top tray of the vacuum tower under flow control as condensing reflux.

Tar stream . . . The tar bottoms product, plus some entrained distillate, flows downward in the vacuum tower into the stripping section of the vessel. Four baffles are incorporated in this section,

VACUUM TOWER and fresh-feed preheating furnace comprise the major equipment in the new vacuum unit.

together with a stripping-steam distributor, located beneath the bottom tray. Superheated steam, introduced beneath the bottom tray through the distributor, flows up through the trays and strips any relatively light material from the downflowing bottoms product.

The asphalt bottoms product is withdrawn continuously, and after exchanging heat with the incoming reduced-crude charge, is further cooled in a box cooler, whence it is routed to storage as deasphalting-unit feed stock.

To insure a sufficient flow of liquid across tray No. 8 (just above the flash zone) of the vacuum tower, and thus provide a wash for the upflowing vapors from the flash zone, a recirculating system is included.

The recirculating pump is installed for this purpose and takes suction from a pan just below tray No. 8 and returning the oil to tray No. 8 through a distributor header. Surplus oil from the pan below tray No. 8 is conducted

"Net result . . . improved selectivity of cracking and increased cat cracking capacity"

through an internal downcomer to a seal pot in the section below the flash zone.

Barometric condenser . . . The steam and noncondensables leaving the top of the vacuum tower enter the primary barometric condenser. Within this latter vessel, cooling water flowing down over internal baffles liquefies the incoming stream and condensable oil vapors associated with it.

The cooling water and condensate flow from the bottom of the condenser vessel to sump below, through a pipe that is sufficiently long to give a gravity head greater than atmospheric pressure. The bottom of this pipe, or barometric drain leg is immersed beneath the surface of the water so as to seal the leg from the atmosphere. Water level is maintained by a weir within the sump, the overflow passing to the sewer.

The relatively small amount of uncondensed steam, hydrocarbon vapor, and fixed gas is pulled from the top of the barometric condenser by two of a set of three parallel steam-jet ejectors. Each ejector discharges into a second-stage barometric condenser, similar to the primary one, and exhausted overhead by a separate ejector. Each second-stage ejector discharges to atmosphere in the sump, on the downstream side of the overflow weir.

A.S.T.M. inspections of feed and products are shown in Table 1.

TABLE 1—A.S.T.M. INSPECTIONS

	Feed	Light vacuum gas oil	Heavy vacuum gas oil	Vacuum bottom	Blend
Gravity	21.1	29.1	26.5	18.3	
Distillation:					
I.b.p.		518	640		
10		579			
30		629			
50		665			
Per cent at 700° F.		70.0	11.0		
Car. res.	3.86	0.01	0.12	6.53	0.10
Pour point	55	55	70		
Color		2½—	8		
Aniline point					
Viscosity at 210°	106.2	36.6	48.7	328	
Flash				535	

TABLE 2

Period—	1	2	3
Crude level, bbl. per day	160,000	161,000	161,000
Reduced crude, bbl. per day*	19,425	19,476	24,004
°A.P.I.	19.6	20.7	20.8
Carbon residue, per cent	6.23	4.94	4.91
Viscosity at 210° F., S.U.s.	170	119	96
Vacuum unit yields:			
Light vacuum gas oil, bbl. per day	0	1,945	2,461
°A.P.I.		28.2	28.9
Carbon residue, per cent		0.09	0.05
Viscosity at 210° F., S.U.s.			
Heavy vacuum gas oil, bbl. per day	0	8,042	10,528
°A.P.I.		23.9	24.4
Carbon residue, per cent		0.47	0.27
Viscosity at 210° F., S.U.s.			
Vacuum bottoms, bbl. per day	0	9,488	11,015
°A.P.I.		16.9	15.8
Viscosity at 210° F., S.U.s.		636	585
Feeds to deasphalting unit:			
Reduced crude, bbl. per day	19,425	0	0
Vacuum bottoms, bbl. per day	0	9,872	12,695
Decant oil, bbl. per day	0	1,608	416
B.s. ext., bbl. per day	0	2,738	1,427
Other, bbl. per day	0		29
Total, bbl. per day	19,425	14,218	14,567
Deasphalting unit yields:			
DAGO, bbl. per day	17,374	10,153	9,203
°A.P.I.	21.7	18.3	20.3
Carbon residue, per cent	3.29	3.76	3.50
Asphalt, bbl. per day	2,051	3,954	5,361
Pen. at 77° F.	100	50	39
Conradson carbon in cat feeds:			
DAGO, lb. per day	184,500	126,400	105,500
LVGO, lb. per day	0	543	380
HVGO, lb. per day	0	12,020	9,020
Total, lb. per day	184,500	138,963	114,900
No. 6 fuel oil, bbl. per day	6,351	4,855	4,709

*Does not include RC to lube plant.

Summary

The installation of the new vacuum unit designed to operate ahead of and to unload the deasphalting unit has materially improved the refinery operations. Most important was the improvement in quality of catalytic cracking unit feed stock. Table 2 shows the improvement in cat feed based on an over-all reduction in carbon residue of the heavy virgin gas oils.

Along with carbon-residue reduction, there was a reduction in the metal contaminants which has reduced the fluid-catalyst poisoning. The quantity of heavy, low-carbon-content virgin feed available for cracking in the "B" catalytic cracking unit over synthetic catalyst was increased and the quantity of the deasphalted gas oil, which was the most contaminated feed processed in the "A" catalytic cracking unit over natural catalyst, was reduced.

The net result of the quality and quantity changes in cat feed have been improved selectivity of cracking and increased catalytic cracking capacity. Table 2 also shows a decreased No. 6 fuel-oil quantity which would be expected when cat cracker feed quantity was increased.

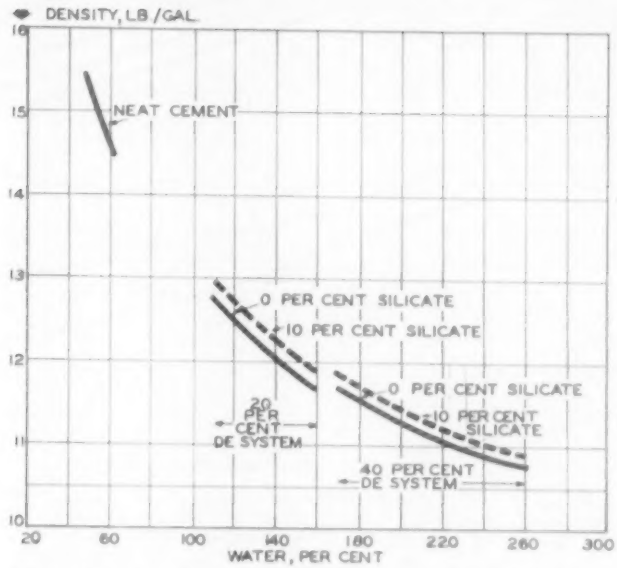
During periods where the crude level and catalytic cracking unit feed inventory permit, advantage is taken of the deasphalting unit capacity for the processing of streams other than vacuum bottoms. In this manner the catalytic cracking unit operations are maintained at maximum earnings.

Incremental feed such as bright-stock extract cut back with cat light cycle oil, cat decant oil, short resid, and other streams are considered on an individual basis prior to pumping of same to thermal unit visbreaking charge tanks. Visbreaking of heavy stock is the final step in the reduction of No. 6 fuel oil.

For better drilling-completion work, a new

Low-Water-Loss, Low-Density Cement

by W. E. Bergman, J. R. Hurley, and F. J. Shell



DENSITY RANGE of the new cement is between 13 and 10.7 lb. per gal., providing a slurry with density equal to that of many drilling muds. Fig. 1.

A NEW and improved oil-well cement has been developed by Phillips Petroleum Co. Advantages are:

- Low water loss, which eliminates the danger of a flash set.
- Low density. Densities as low as 10.7 lb. per gal. may be obtained with commercially available materials.

To obtain this new cement two special additives are used. These are: carboxymethyl hydroxyethyl cellulose (CMHEC) (Hercules Powder Co.), and a special grade of diatomaceous earth (DE) (Johns-Manville Corp.). The CMHEC is used for controlling the water loss and for retarding the thickening time. DE permits the use of high percentages of water in the cement to obtain low-density slurries.

In addition to these, bentonite and sodium silicate are used to give the cement the most desirable properties. The low-density systems, designated as the 20 and 40 per cent DE cements, have been tested. Their compositions may be summarized as follows:

Component—	Per cent* in— 20 parts DE	40 parts DE
Cement	100	100
DE	20	40
Bentonite	2	2
CMHEC	1.0	1.5
Sodium silicate	Variable	Variable
Water	Variable	Variable

*"Per cent" refers to parts weight per 100 parts cement.

Fig. 1 shows the densities that may be obtained with each system. In Table 1 the water losses for each system are shown.

Why the new cement? . . . Recognizing the importance of successful cementing of casing in the drilling and completion of oil wells, Phillips has been working to obtain more suitable cements. Neat slurries of common portland cement fulfill the necessary requirements in many cases. But other problems arise with their use. These problems are generally the result of two properties of the slurry—density and water loss.

Density . . . The ideal cement slurry density is one equal to that of the drilling mud. Cement slurries having densities as low as 13 lb. per bbl. can be formulated with portland cement admixed with bentonite (gel) and various pozzolanic materials.[16 18 20 21] But there exists a considerable gap between this density and that of many muds used in drilling operations.

Water loss . . . Many of the advantages of low-water-loss cements are the same as for low-water-loss drilling fluids. In addition, there are other less-obvious reasons for using low-water-loss cement. To minimize channeling and obtain a better cement job, it is desirable to rotate or reciprocate the casing.[9] The danger of sticking the pipe with dehydrated cement is essentially removed with the use of low-water-loss cement.

Even when it is not desirable to move the casing during cementing, the usual danger of "flash set" because of cement dehydration is removed by the use of low-water-loss cement. Low-water-loss cement is also necessary for success of permanent-type well completion.[10]

Neat cements have A.P.I. water losses in the range of 400 to 1,000 ml.[3] Gel cements containing calcium lignosulfonate generally have water-loss values greater than 100 ml.[18 19] At the present time only one cement is sold as a low-water-loss cement, although many such systems are described in the patent literature.[4 11 12 13 14 15 17]

This new cement solves both of these problems.

Function of Additives

The diatomaceous earth (DE) which is admixed with the cement has a density of 2.07 g. per cc. This results in some decrease in slurry density of the cement. However, the major function of the DE is to permit addition of more water.

Permissible water . . . The minimum and maximum water contents for operable mixtures of DE and cement were found to be:

DE, per cent	Water, per cent Min.	Max.	Slurry density (lb. per gal.) At max. water	At min. water
0	40	63	14.4	16.3
10	80	110	12.5	13.6
20	110	>140	<11.95	12.7
40	170	>280	<10.6	11.7

The densities of the slurries determined at atmospheric pressure are about 0.1 lb. per gal. less than the computed value. This is attributed to a small amount of air occluded in the slurry during mixing. The densities of slurries set under pressure agree closely with computed values. Hence, unlike some types of cement, the slurry density or volume as measured at the surface of the well need not be corrected for pressure.

From the above tabulation it is evident that the permissible variation or

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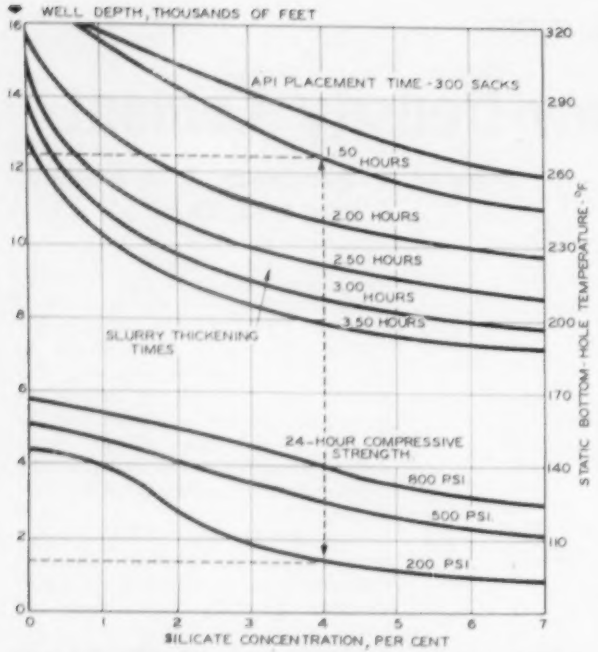
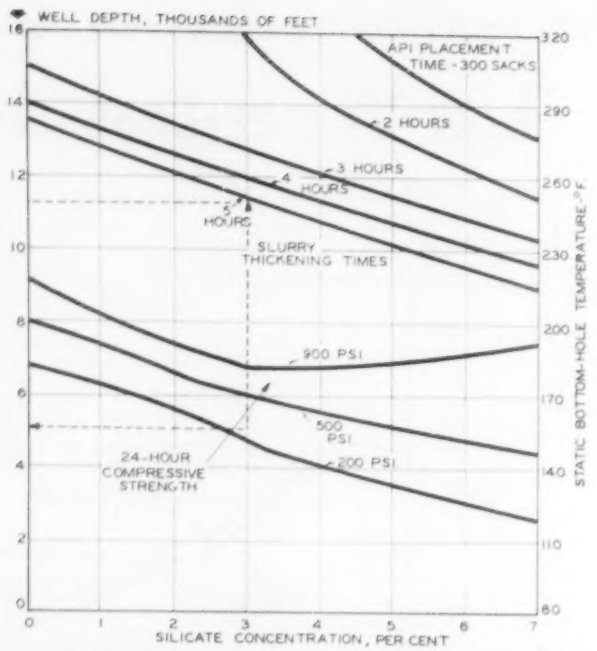


SILICATE ADDITION governs the upper and lower placement depths of the cement. Chart for 12.5-lb. per gal., 20 per cent DE, 2 per cent bentonite, 120 per cent water slurry. Fig. 2.



THICKENING TIME and strength of the cement permits use at wide range of depths. Chart for 11-lb. per gal., 40 per cent DE, 2 per cent bentonite, 220 per cent water slurry. Fig. 3.

the range for percentage water increases with increase in percentage DE admixed with the cement. Other ingredients—bentonite, CMHEC, and silicate—of low-water-loss systems do not materially affect the water-to-cement ratio.

For the two systems which have been developed, the recommended water content is approximately midway between the maximum and minimum value, and the range is conservatively set pending more complete results on the properties of the slurry as a function of percentage water. Fig. 1 may be used as a guide to determine the slurry density for the systems described in this report.

While DE is the principal bulking agent, it was found desirable to admix 2 per cent bentonite with the cement. The early strength developed by the cement is at a maximum with bentonite concentrations of 2 to 3 per cent. Concentrations of bentonite higher than 4 per cent cause marked reduction in the strength. Bentonite has no pronounced effect on the thickening time.

Function of CMHEC . . . As with neat cement, the primary function of the CMHEC is for water-loss control. In each type of system the concentration of CMHEC must be selected to give the desired control of the filtration rate. On the basis of test results 1.0 per cent CMHEC was selected as a suitable concentration for the 20 per cent DE system and 1.5 per cent for the 40 per cent system.

These concentrations give initial water-loss values less than 20 ml. The water-loss control is not appreciably changed by moderate variation in the water-to-cement ratio. This is illustrated in Table 1 which also presents data showing the effect of aging at 180° F. upon the water loss of the slurries.

The increase in water loss after aging may be attributed at least in part to changes in properties of the slurry as the cement thickens and to the effect of temperature upon the filtration rate. On the basis of these results as well as tests made on slurries aged under pressure at high temperatures, good water-loss control is maintained until the slurry becomes thick.

Agitation helps . . . Another factor of

TABLE 1—FILTRATION RATE OF THE 20 AND 40 PER CENT DE SYSTEMS AS A FUNCTION OF PER CENT WATER AND SILICATE

Water, per cent—	Silicate (per cent)	Water loss, ml. per 30 min.* Initial	Aged 1 hr.	Aged 2 hr.
Part A—20 per cent DE system:				
110	0	11	27	45
110	1			25
110	3			22
110	5	15		†101
140	0	14	19	36
140	1			23
140	3			23
140	5	15		†101
Part B—40 per cent DE system:				
180	0	15		33
180	3	15		25
180	5	15		110
220	0	18	24	27
220	3	18	22	27
220	5	18	16	27
220	7	16	25	(†)
220	10	11	(†)	
260	0	20		33
260	3	21		26
260	5			26
260	7	16	25	
260	10	22	26	

*Initial values determined at room temperature. For the other tests the slurries were aged at 180° F. for 1 or 2 hours, then filtered at 180° F. †For these tests the slurry had thickened so that the filtration rate could not be determined or the value obtained becomes high.

importance with water-loss control is the degree of agitation of the slurry. It is evident that a definite period of time and agitation is required in order to disperse the CMHEC in the slurry. In general, the 35-second mixing period in the Waring Blendor as specified in A.P.I. Code 10A[1] does not produce maximum effectiveness of the CMHEC for initial water-loss control, but near-maximum effectiveness is achieved in about 60 seconds.

With less vigorous agitation, such as with the kitchen-type mixer described in A.P.I. Code 10A, the time required is on the order of 2 to 5 minutes. In terms of field practice this implies that a low water loss is not developed simply by jet mixing but will develop as the cement is pumped. A field test established that a low water loss was achieved by the time the cement left the pumps of the cementing truck.

Silicate speeds set . . . Since CMHEC acts as a retarder of the thickening time, the low-density systems containing CMHEC as the only other additive develop little or no strength in 24 hours when cured at atmospheric pressure at temperatures to about 180° F. This demanded incorporation of a material which would accelerate the thickening and setting reaction without adverse effect on the water loss.

Commonly applied accelerators like calcium chloride nullified water-loss control by CMHEC when used at concentrations high enough to give the desired acceleration. Sodium silicate was discovered to be very promising. Sodium silicate is obtainable as a solid or as a solution with varying silica to soda ratio.

Painstaking work established that the best type of silicate had a silica-to-soda ratio of two to one. Other tests established that anhydrous silicates when dry blended with the cement are less active accelerators of the thickening time than are hydrated salts. However, concentrations of anhydrous silicates appreciably higher than those of hydrated salts might be applied by dry-blending with cement, DE and other ingredients to achieve greater early strength. Unless otherwise stated the silicate used in all tests represents a powdered, anhydrous product having the optimum silica-to-soda ratio.

TABLE 2—COMPRESSIVE STRENGTH OF CEMENTS PREPARED WITH CLASS A CEMENT, 20 PER CENT DE, 1 PER CENT CMHEC, 2 PER CENT BENTONITE, 0-12 PER CENT SODIUM SILICATE AND WATER
(Slurries were cured at simulated well conditions*)

Depth (ft.)	Water (%)	Time, days	Compressive strength, psi., with indicated per cent silicate							
			0	0.5	1	3	5	7	10	12
0	120	3					100	120	200	
0	120	7					375	520	680	
2,000	120	1				240	340	420	450	
2,000	120	3	225	325	445	710	1,020	1,290	1,360	1,450
2,000	140	1				110	190	255	275	
4,000	120	1	15	130	170	570	950	1,140	1,150	
4,000	120	3	1,260		1,410	1,430	1,520	1,550	1,520	
4,000	140	1	20	70	125	420	670	800	1,000	1,000
6,000	120	1	910	1,070	1,070	1,440	1,430	1,490	1,790	
6,000	140	1	540	660	730	880	930	920	1,260	1,320
10,000	120	1	1,040	1,220	1,360	1,340	1,530	1,520	1,800	1,840
10,000	140	1				930	1,020			
14,000	120	1	980	1,050	1,160	1,560	1,640			
14,000	120	3	1,100	1,170	1,230	1,450	1,480			
14,000	140	1	650	780	910	1,060	1,090			
14,000	140	3	730	840	860	1,010	1,130			

*Curing pressure was atmospheric for zero depth, 1,600 psi. for 2,000 ft. and 3,000 psi. for other depths. After the initial 4-hour heating period the temperature was 80 + (0.015) × (depth).

TABLE 3—COMPRESSIVE STRENGTH OF CEMENTS PREPARED WITH CLASS A CEMENT, 40 PER CENT DE, 2 PER CENT BENTONITE, 1.5 PER CENT CMHEC, SODIUM SILICATE, AND WATER WHEN CURED UNDER SIMULATED WELL CONDITIONS*

Depth (ft.)	Water (%)	Curing time, days	Compressive strength, psi., when containing (per cent silicate)				
			0	1	3	6	10
2,000	200	1	0	0	6	36	100
2,000	220	1	0	0	2	23	70
2,000	220	3	34	70	170	300	520
2,000	240	3	32	60	125	270	390
4,000	200	1	17	36	135	440	670
4,000	220	1	12	20	95	340	500
4,000	240	1	8	16	95	330	430
4,000	260	1	10	15	65	240	360
6,000	200	1	130	165	870	890	790
6,000	220	1	54	145	730	680	620
8,000	200	1	900	1,030	1,190	1,145	990
8,000	220	1	520	805	1,040	1,020	780
8,000	240	1	210	370	840	770	640
8,000	260	1	21	360	650	630	520
10,000	200	1	1,400	1,450	1,250	1,460	1,230
10,000	220	1	1,010	1,140	1,020	1,220	1,000
12,000	200	1	345	385	660	1,510	1,350
12,000	220	1	315	320	440	1,300	1,050
14,000	200	1	160	380	1,020	1,470	1,320
14,000	220	1	115	270	790	1,330	1,110
14,000	240	1	100	240	500	1,140	820
14,000	260	1	75	150	285	810	680
14,000	220	3	1,380	1,240	1,290	1,400	1,120
14,000	240	3	1,160	1,170	1,060	1,220	930
16,000	220	1	280	325	430	990	710
16,000	240	1	190	270	365	700	620
18,000	220	1	1,040	1,090	980	950	750
18,000	240	1	930	970	860	850	650

*Curing pressure was 1,600 psi. for 2,000 ft. and 3,000 psi. for all others. After the initial 4-hour heating period, the temperature was 80 + (0.015) × (depth).

Tests

To define conditions for use of the new cements it was necessary to determine pumpability of the slurries and the strength the cement would develop under well conditions.

Usable to 16,000 ft. . . . The thickening time of the 20 and 40 per cent DE systems under simulated well conditions is shown as a function of well depth and concentration of sodium silicate in Figs. 2 and 3. With either system, the thickening time is adequate to permit pumping to depths of 16,000 ft. when the silicate concentration is zero. Even with 7 per cent silicate either the 20 or 40 per cent DE system may be pumped to 12,000 ft.

Consequently, unless the cementing depth is greater than 12,000 ft. or if pumping time at shallower depths is exceptionally long due to volume of cement being mixed or for other reasons, the thickening time of these slurries permits a large margin of safety.

It should be noted that the thickening time as reported in Figs. 2 and 3 were determined with 120 and 220 per cent water, respectively. These water contents will be generally preferred, but higher or lower water contents may also be applied.

The thickening time is proportional to the percentage water, but no fixed rule may be given regarding the rate of change in the thickening time with change in percentage water. The available data show that variations amounting to ±25 per cent water by weight of cement will not be serious unless

the margin of safety between the thickening time and the estimated pumping time for the given well conditions is less than 30 minutes.

Strength sufficient . . . The compressive strengths developed by these cements under simulated well conditions are reported in Tables 2 and 3. Some of the results are illustrated in Figs. 2 and 3. For either the 20 or 40 per cent DE system these results illustrate the marked effect of sodium silicate on the 24-hour strength.

Limited data indicate that there is a linear relationship between strength and the logarithm of time during the first 7 days when the cement is cured at atmospheric pressure. During this period the strength is a direct function of silicate concentration but thereafter is essentially independent of the silicate. Hence, the ultimate strength developed by the slurry is believed to be independent of the silicate.

For the 20 per cent DE system, there is little evidence that retrogression of strength occurs at high temperatures. With the 40 per cent system, however, retrogression was found. This phenomenon has been previously observed with various oil-well cements. This work[22] showed that at some "critical" temperature—about 220° to 240° F.—the 24-hour strength of the cement was at a maximum and that as the temperature increases the 24-hour strength decreases. The period of retrogression generally lasted for about 7 days.

Depth limit . . . From Table 2 or Fig. 2 for the 20 per cent DE cement it is apparent that 24-hour strengths greater than 200 psi. may be obtained at depths of 1,000 ft. provided the silicate concentration is more than 7.0 per cent. However, even with 10 per cent silicate in this system, no strength is developed in 24 hours at 80° F. and atmospheric pressure. Hence, the upper placement limit for this system is dictated by the strength developed; and with a 24-hour waiting-on-cement period the limit is about 1,000 ft.

Similarly, with the 40 per cent system the upper placement limit becomes about 2,300 ft. when using 10 per cent silicate. With either the 20 or 40 per cent system, increase in the waiting-on-cement time to 48 hours would decrease values for the upper placement limit by about 50 per cent.

These conclusions for placement limits are based on results obtained when the water content of the slurry is 120 and 220 per cent with the 20 and 40 per cent DE systems, respectively. The strength developed by these slurries is a direct function of the slurry density or an inverse function of the water content as illustrated in Tables 2 and 3. However, variations in the water content amounting to ±20 per cent by weight of the cement do not appreciably alter these conclusions.

"The ideal cement-slurry density is one equal to that of the drilling mud . . . danger of sticking the pipe with dehydrated cement is essentially removed with the use of low-water-loss cement."

Selecting composition . . . The previous discussion emphasizes the need for proper choice of cement composition to meet the conditions of the cementing operation. To facilitate proper selection of the cement composition for the particular job or to define the operable range of a given composition, Figs. 2 and 3 may be applied. These charts summarize the most pertinent data by showing thickening time and strength as a function of well depth and silicate concentration.

For example, using Fig. 2, the 20 per cent system containing 4 per cent silicate will have a 24-hour strength of 200 psi. or more at depths greater than 1,400 ft. and the thickening time will be greater than 1.5 hours at all depths to 12,400 ft. The operable depth for this composition is, therefore, between 1,400 and 12,400 ft.

As another example, if it is desired to use an 11-lb. per gal. slurry to cement casing set at 12,000 ft. with fillup to 5,000 ft., the 40 per cent DE system containing 3 per cent sodium silicate would allow more than 3 hours for placement and give a 24-hour compressive strength between 200 to 500 psi. at depths between 5,000 and 6,100 ft. and greater than 500 psi. at depths between 6,100 and 12,000 ft.

Field usage . . . Many factors pertinent to field application of these low-water-loss systems have been considered. In field tests which have been conducted to date, no factors have been found which seriously impair the applicability of these systems. The dry blends used for preparing the slurries have been found to remain stable in storage.

Contaminants such as soluble electrolytes which might be present in the makeup water can be tolerated in amounts to at least 10,000 p.p.m. Contamination with drilling mud or the reagents used in muds is, of course, undesirable but the effect of such contamination is not considered more serious than with other types of cement. Field tests with the systems herein described are continuing.

Acknowledgment

The application of diatomaceous earth of a suitable type for control of the slurry density was suggested by Roy Bobo, of Phillips Petroleum Co.'s production department. Hercules Powder Co. prepared samples of carboxymethyl hydroxyethyl cellulose which were used during the course of this study to establish desirable ranges for the physical and chemical properties of the material.

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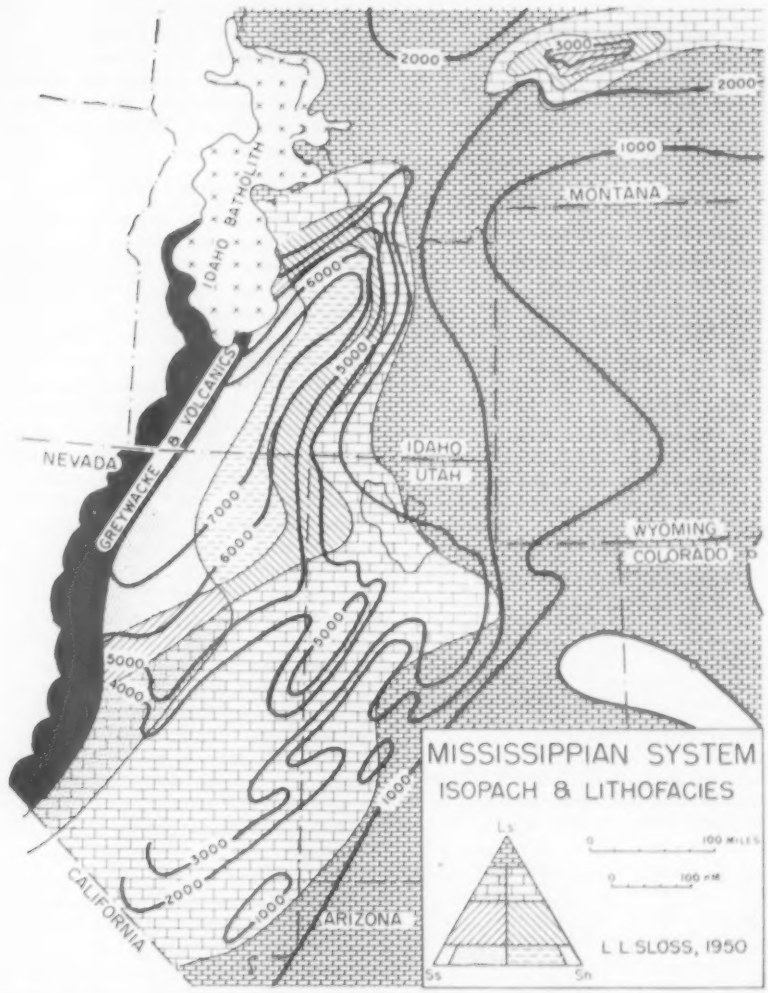


COMPARISON of the Mississippian of the Great Basin with other areas indicates that conditions are favorable for oil accumulation. Fig. 1.

FACIES STUDIES...

. . . an important tool in oil finding

by L. L. Sloss

STRUCTURE, source beds, and reservoir strata are required for oil and gas accumulation; but only structure has been generally considered as amenable to precise analysis.

The characteristics of the source and reservoir rocks themselves are complex. And they are compounded of so many variables as to defy any single expression and analysis, except in terms of thickness and volumes. It is, nevertheless, the task of the geologist to sort out those conditions and associations which are likely to be related to petroleum accumulation. This sorting-out process and the development of guiding principles may be simplified by the application of various techniques of facies analysis.

The author is with the department of geology, Northwestern University, Evanston, Ill. This is an abridged version of a paper presented at the Fourth World Petroleum Congress, entitled "Location of Petroleum Accumulation by Facies Studies." Copyright 1955 by Carlo Colombo, Rome.

Facies studies . . . A useful working definition of sedimentary facies is: "any **areally restricted part** of a **designated stratigraphic unit** which exhibits characters significantly different from those of other parts of the unit" (definition from R. C. Moore, 1949).

It is implicit in Moore's definition that facies are lateral variations in the character or **aspect** of a distinct stratigraphic unit and that such variations in aspect are best expressed on a map.

A tentative classification of facies studies is presented; but it is recognized that differences in complexity and in the availability of data would force modification of the categories in individual instances (see Tables 1, 2, 3).

A. **Regional studies**—covering a very broad area (in the order of magnitude of a million square miles, or several states and provinces in the United States or Canada) and involving tectonic and sedimentary provinces.

B. **Semiregional studies**—covering a distinct tectonic and sedimentary province, such as a depositional basin, or adjoining and related parts of two such provinces. This category is frequently referred to "basin studies" but no well-defined basin need necessarily be involved.

C. **District studies**—covering a smaller part of a sedimentary province

TABLE 1—SINGLE-COMPONENT SEDIMENTARY ASPECTS

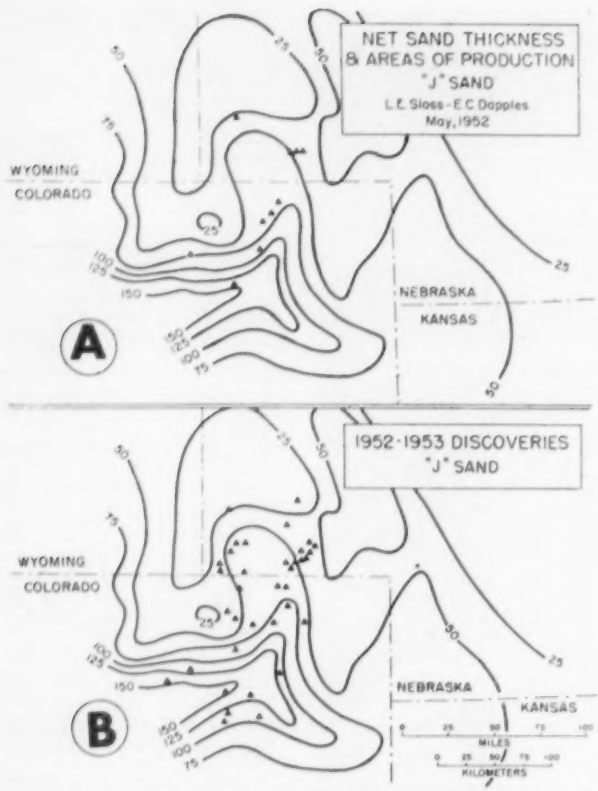
Aspect	Example
Net thickness of specific lithology in a stratigraphic unit	Net sand map
Texture	Medium grain size
Composition	Hydrocarbon content
Vertical variability	Number of discrete sand bodies

TABLE 2—TWO-COMPONENT SEDIMENTARY ASPECTS

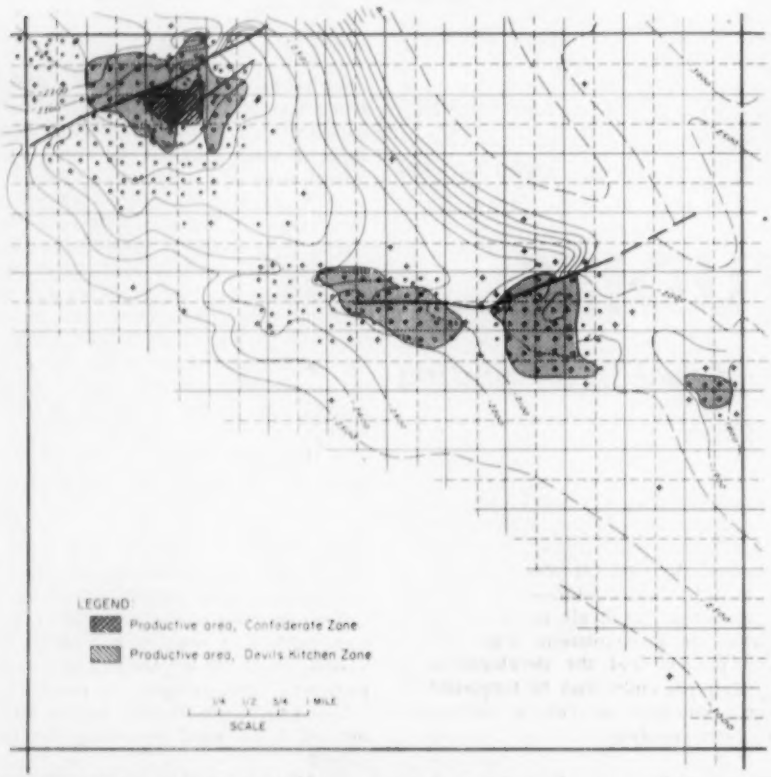
Aspect	Numerator (thickness of)	Denominator (thickness of)
Sand-shale ratio	sandstone	shale and siltstone
Clastic ratio	detrital sediments	chemical sediments
Evaporite ratio	evaporites	carbonates
Graywacke ratio	graywacke	arkose + quartzose sandstone
Dolomite ratio	dolomite	limestone
Bioclastic ratio	bioclastic carbonates	non-bioclastic carbonates

TABLE 3—EXAMPLES OF FACIES ANALYSES APPLICABLE AT SEMI-REGIONAL LEVEL

End Members	Interpretative product
Limestone, dolomite, evaporite	Reefs and other carbonate reservoirs
Positive "Eh," negative "Eh" (Oxidation-reduction potential)	Source-reservoir relationships; reefs
Brackish, near-shore, off-shore faunas	Sand bars
Quartzose sand, graywacke	Sand permeability traps



DATA AVAILABLE in 1952 (A) showed that more discoveries could be forecast for the J sand in the Denver-Julesburg basin (B). Fig. 2.



STRUCTURE on top of the Confederate zone and the productive areas, Carter County, Oklahoma (L. L. Sloss-E. C. Dapples, 1952). Fig. 3.

and usually involving several areas of oil production from a variety of stratigraphic positions.

D. **Pool studies**—covering specific producing trends and often confined to very limited portions of the stratigraphic column.

Regional Studies

Depending on the degree of development of the area involved, regional facies studies are generally undertaken in an attempt to answer one of the following questions:

1. If the area is without substantial oil production, are there possibilities for the discovery of major accumulations; and, if such possibilities exist, where are the most logical places for the expenditure of exploration budgets?

2. If the area has been proved for significant production, where can the condition known in the productive localities be duplicated?

Although a wide choice is available among the sedimentary aspects to be mapped, the field is commonly narrowed by the nature of the raw stratigraphic data usually available for regional studies. Experience to date suggests that a simple three-component system, using chemical sediments, sandstones, and shales as end members, can make use of even reconnaissance data and can yield a map from which a number of valuable interpretations can be made.

Mississippian of the Great Basin . . . The Great Basin area, lying between the Sierra Nevada and the western margin of the Rocky Mountains in southern Idaho, Nevada, and western Utah, is typical of the little-known areas for which regional facies analysis provides a basis for evaluation. The area has been considered as part of the Cordilleran geosynclinal system and this tectonic implication has served as a deterrent to active oil exploration. No pre-Tertiary production has been found and, at the time (1950) that the accompanying map (Fig. 1) was prepared, no subsurface data were available. The map represents a compilation of widely scattered points taken from mining-district studies and local map areas.

The combined facies-isopach map indicates that much of the area of interest is occupied by a complex basin with thicknesses in excess of 7,000 ft., westward increase in shale content to the axis of the basin, and with a rise in sand content as the orogenic trend, dominated by graywackes and volcanics, is approached at the western border of the map area. These patterns are strikingly similar to those known in the Mississippian and lower Pennsylvanian of the Anadarko basin (Oklahoma) and the Mississippian of the Al-

berta syncline and Williston basin (Montana, North Dakota, and Saskatchewan; western end showing at northeastern corner of map). All of these have important Mississippian production from within the basins and at their margins. The map suggests that the Great Basin area has possibilities which need further study and points out the trends of maximum facies change along which intertonguing of source and reservoir strata may be expected.

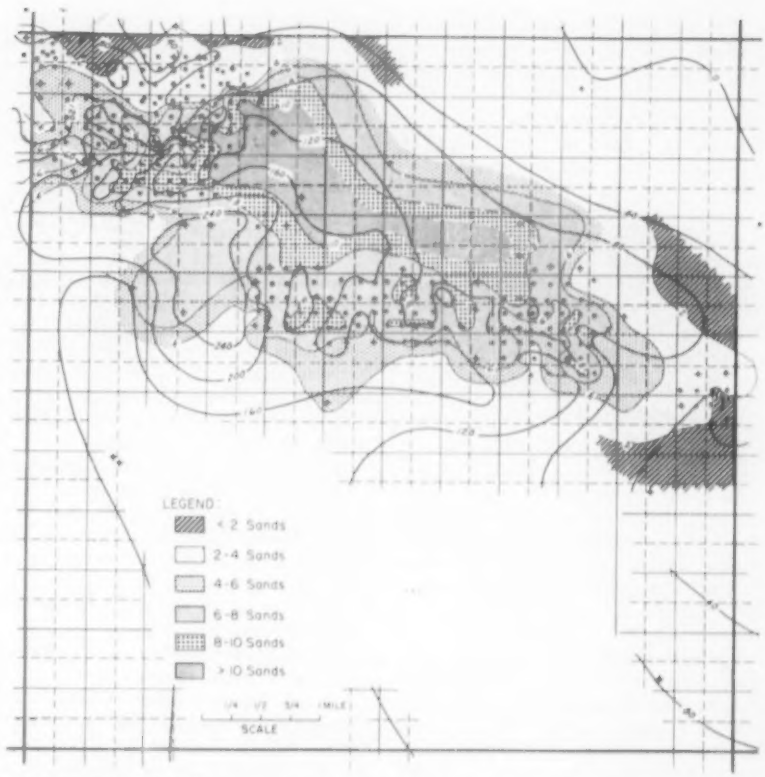
Space limitations prevent presentation of maps and analyses of other units which tend to confirm the interpretations noted above. The point which the writer hopes he has established is that regional facies studies provide a mechanism for the integration of scanty data from little-known areas and make possible the critical comparison of such areas with regions of known oil production.

Semiregional Studies

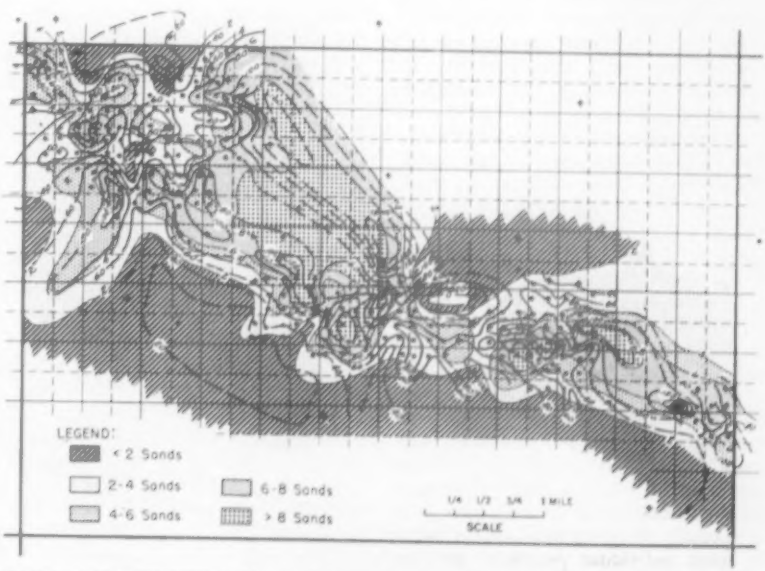
At the semiregional level, studies are confined to a more limited area, often within a single depositional province. Correlations are more easily established than at the regional level and individual rock units or biostratigraphic zones can normally be traced with confidence throughout the area concerned. As a result, facies analysis may be applied to relatively thin and rigorously defined bodies of rock and the relationships of facies to oil accumulation are more directly observable. Furthermore, semiregional studies can commonly take advantage of detailed core and sample studies and intensive outcrop investigations and the resulting data can be applied to the mapping of a variety of sedimentary aspects which are not available in regional investigations. The accompanying examples present relatively simple cases but a number of other opportunities exist. Some of these are suggested in Table 3.

Cretaceous of Julesburg basin . . . The Julesburg basin is a large structural and depositional feature beneath the Great Plains and lying east of the Rocky Mountain Front Range in eastern Colorado, southeastern Wyoming, and parts of adjacent states. In recent years substantial oil accumulations have been discovered in Cretaceous sands along the northeastern margin of the basin in western Nebraska and northeastern Colorado. The accompanying maps (Fig. 2A and B) illustrate an apparent relationship between a simple single-component facies pattern and recent discoveries in one of the Cretaceous sand zones, the J (or Cruise) sand of Cenomanian age. Data are modified from the findings of Bourn (1952).

Electric logs of wells penetrating the J sand were examined and the average spontaneous potential curve expression of Cretaceous shales ("shale line") was determined for each well. All spontaneous potentials in excess of 15 mv. beyond the shale line, and lacking resistivity indications of limestone or chalk, were considered as sandstones and the net sand thickness for the J sand interval were plotted and contoured as shown. The upper map shows the net sand isopach and the distribution of production from the J sand as of the end of 1951. A general relationship can be seen between oil accumulation and the northern projection



CONFEDERATE ZONE—Net sand isopach and number of sands, Carter County, Oklahoma (L. L. Sloss-E. C. Dapples, 1952). Fig. 4.



DEVILS KITCHEN ZONE—Net sand isopach and number of sands, Carter County, Oklahoma (L. L. Sloss-E. C. Dapples, 1952). Fig. 5.

of a trend of thick sand occurrence, although the thickness of oil-saturated sand bears no discernible relationship to the thickness of sand present. The lower map shows the extent of discoveries in the J sand in 1952 and 1953 superimposed on the same 1952 isopach pattern used for the upper map. It is thus apparent that sufficient data were available in early 1952 to outline the general area in which further J sand discoveries could be anticipated. Obviously, more complex patterns than simple sand thicknesses are involved, but this single aspect was capable of providing a rational exploration guide.

District and Pool Studies

Discussion of facies application at the district and oil pool levels are combined in this treatment for two reasons: (1) both differ significantly from the broader scale regional and semiregional studies, but district and pool studies have many problems in common which can conveniently be covered under a single heading; (2) methodology and interpretations of facies analysis at this detailed level are in an expanding phase of industrial development and application; as a result, explicit examples are not readily available for publication.

Facies studies at the district and pool level face problems at quite a different scale from those of regional and semiregional studies. The broad investigations discussed in previous paragraphs are designed to tell whether or not certain parts of the stratigraphic column have possibilities for oil accumulation IF they can be found in appropriate structural positions, or IF the indicated truncations and pinchouts can be located.

District and pool studies, on the other hand, typically involve local areas with established production and reserves and with abundant data on structure, positions of unconformities, and fluid content of numerous proved or potential reservoir zones. It is the stratigrapher's task to aid in increasing the district's reserves by recommending specific drilling locations beneath which one or more potential reservoir zones may be expected in favorable development. In other words, at the local level facies studies become a direct oil-finding tool and require the sensitive treatment accorded other precise methods.

In an established oil-producing district facies studies can be of particular value in the location of permeability traps. Many of the previously discussed end-member combinations and aspect mapping techniques, as well as a host of specially designed treatments created to meet individual problems, can be brought to bear on problems such as:

- If a reef trend is known to exist in the district and is related to production, which structure among several geophysical anomalies has the greatest possibility of representing an undiscovered reef? Harrington et al. (1953) have shown that certain Carboniferous reefs in Texas have a trail of reef-flank detritus in the lee of the main reef mass. It is clear that facies mapping of reef-flank and interreef textures would aid in such cases.
- If offshore bars separating open-sea and lagoonal deposits have been found to be important reservoirs, how may such features, or "near misses," be recognized? Here biofacies maps leading to environmental interpretations of lagoonal, littoral, and shallow-neritic deposits are indicated.
- Channel sands are a difficult problem within many producing districts. In an as yet unpublished oral paper Nanz (1953) has shown that detailed facies studies involving grain size, cementation, and clay mineralogy can contribute significantly to the solution of such problems.
- Permeable sands are commonly recognized to be related to the crests or flanks of structures which were forming contemporaneously with deposition. Simple sand-shale ratio maps aid in identification of the structural trends along which such sand developments may be anticipated.

Pennsylvanian sands of Oklahoma . . . Many of the important Pennsylvanian (Upper Carboniferous) sands of the southern Mid-Continent area are characterized by very complex facies patterns which reflect tectonic activity concurrent with deposition. An abundance of excellent subsurface data in the fields producing from these sands makes possible a detailed analysis of the facies patterns and their relationship to oil accumulation. Two closely related sand zones, productive in certain of the fields of Carter County, Oklahoma, are used as examples and the accompanying maps are based on data from wells spaced 660 ft. apart in the densely drilled pool areas.

"Would you believe it—I get over a hundred miles to the gallon on your gas?"

The structure of the immediate area concerned (Fig. 3) is a broad anticline, plunging gently toward the west with a few local areas of closure related to transcurrent faults. As indicated by the map, the upper of the two zones considered (Confederate zone) has a very limited area of production in a few wells on top of one of the small local closures. The lower, or Devils Kitchen, zone has much broader areas of oil accumulation and these areas are not so closely related to the highest structural positions.

Investigation of the Confederate zone in terms of net thickness of sand and number of sand bodies present (Fig. 4) indicates a relatively simple pattern only moderately influenced by the structural trends and exhibiting low rates of change in both thickness and number of sands. It is apparent that there are few interruptions of individual sand bodies and that any contained oil or gas is capable of migrating long distances to the highest structural positions. Within the area concerned and under the prevailing hydrodynamic conditions only the single small area near the west edge of the map has sufficient structural relief for entrapment of oil in the Confederate zone.

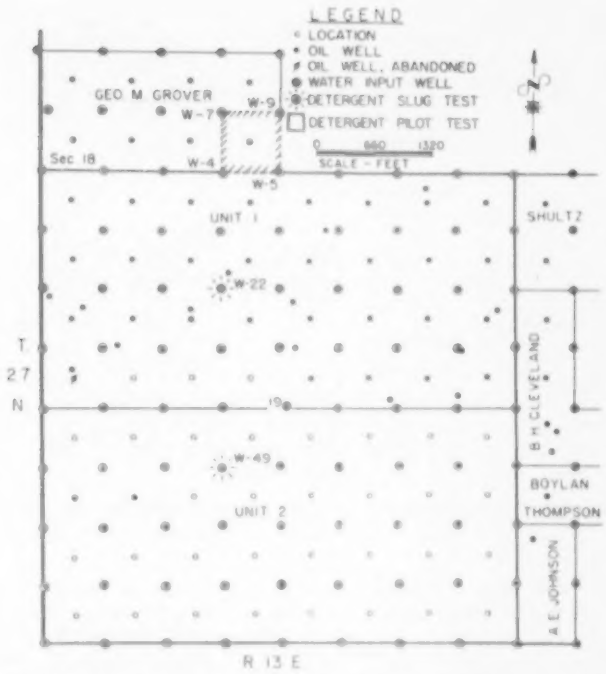
The Devils Kitchen zone (Fig. 5) presents a somewhat different picture. Thicknesses of sand are quite variable and are clearly influenced by the structural trend, with a belt of thick sand on the northern flank and very high rates of change along the structural axis. Similarly, the numbers of sands exhibit a strong influence by the structural trend; except for a local area on the northern flank of offstructure areas are marked by fewer than two sands, while the structural axis is marked by extreme lateral variation from two to eight sands. The pattern suggests that there are numerous possibilities for pinchouts among the lenticular sand bodies and that traps may be anticipated without necessity of structural closure, thus explaining the broader area of production in the Devils Kitchen zone.

Detailed studies of this type, while of no particular exploration value in fields with well defined productive limits, are significant in revealing the potentialities of adjacent structural trends and other areas which display similar facies relationships. It is interesting to note that the basic patterns of the mapped examples could have been outlined with data from a much smaller number of wells at an early stage in the development of the fields.

What Detergent Injection Did at Grover Water Flood

Field tests were made because tests in the laboratory showed treatment will increase oil displacement from small cores.

by H. N. Dunning, R. T. Johansen, C. J. Walker, J. P. Powell, and J. W. Watkins



PLOT PLAN of Hoyt Oil Co. Grover flood, Washington County, Oklahoma. Fig. 1.

AFTER 1 year of testing detergents in the Grover water flood of northeastern Oklahoma, these results have been obtained:

- Effective formation permeability increased, and skin factors improved in most of the wells tested, as a result of detergent injection.
- Increased injectivity followed detergent injection, but this was temporary. Skin factors of some of the wells showed permanent improvement.
- Injectivity of comparatively impermeable water-input wells increased more during detergent injection than did loose or controlled wells. This indicates that zones of the oil-productive sand previously either inaccessible or impermeable to injection water were penetrated by the detergent solution.
- Some increases in oil production were observed, but little definite increase in oil-production rate or lessening of normal production-decline rate may be cited as a result of detergent injection. Increases in oil production resulting from increased water injection rates may not be observable for some time.

Five-year flood . . . Water flooding was begun on the Hoyt Oil Co. Grover lease, Washington County, Oklahoma, in January 1950. A map showing the status of the project to November 1, 1954, is shown in Fig. 1.

Authors are with Bureau of Mines, Petroleum Experiment Station, Bartlesville, Okla.

The formation being flooded is the Bartlesville sand which occurs at a depth of about 1,300 ft. in the Cherokee shale group of Pennsylvanian age. Within the flooded area there is an average thickness of 22 ft. of pay sand. The flood has been highly successful—about 2,000 bbl. of oil per acre was produced by primary methods. About 1,500 bbl. per acre was obtained during the first 5 years of flooding.

About 7,500 bbl. of the 8,300 bbl. of water injected daily during the detergent tests was pumped from the Caney River which flows through the property. The remaining 800 bbl. of water was brine produced from the Bartlesville sand and separated from the crude oil in gunbarrels.

The potential corrosivity and plugging characteristics of the injection water are low because concentrations of free carbon dioxide, carbonates, and iron are low.

Before injection, the water is treated with lime, alum, and high-test hypochlorite. After treatment, the water flows through two sedimentation ponds and is filtered.

Why the tests . . . Field tests were made because laboratory tests[1,2,3,4,5,6,7,8,11] have shown conclusively that detergent solutions will increase the displacement of oil from unconsolidated sand and small cores.

Published literature[9,10] also indicated that significant increases in water-injection rate, obtained by the use of detergents in field water floods, will increase oil production and, ultimately, oil recovery.

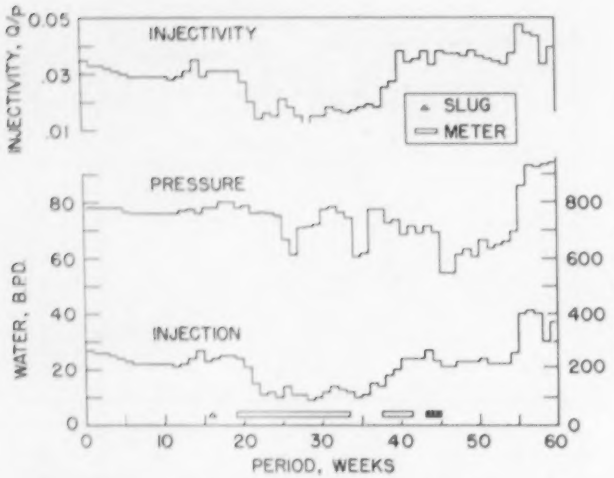
Well-Performance Tests

Tests were made at water-input wellheads to compare performance characteristics of those wells before, during, and after detergent injection. These tests were of two types: (1) Injectivity-index and (2) pressure-decline rate.

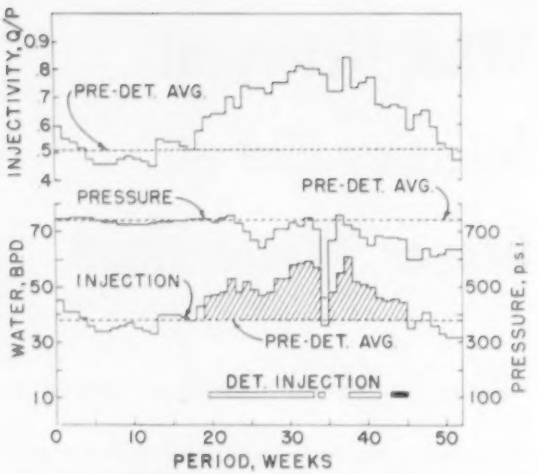
The term injectivity index, is used here to designate the localized injectivity index.[12] The term "injectivity" denotes the the value of Q/P when Q = injection rate (barrels per day) and P = wellhead pressure (psig.).

Wellhead pressures and injection volumes were recorded daily. Two methods were used to determine weekly averages of injectivity for groups of input wells affected by detergent injection. In the first method, the injectivity (Q/P) of each well was calculated and the results averaged [$\Sigma Q/P)/n$, Fig. 5]. In the second, the average injection rate of all wells was divided by the average wellhead pressure ($\Sigma Q/\Sigma P$, Fig. 6).

The pressure-decline rate test can be used to determine the effective-formation permeability and the skin factor of an input well.[13] The skin factor relates the permeability of the zone immediately around the well bore to that of the formation as a whole. A positive skin factor denotes a zone around



INJECTION RECORD of well HW-22 (1954 and 1955). Fig. 2.



AVERAGE INJECTION RECORD of wells GW-7, HW-4, and HW-5, 1954. Fig. 3.

the well bore of lower permeability than that of the surrounding formation.

Slug Treatment

The field test was initiated by selecting two wells, Hoyt W-22 and Hoyt W-49, for treatment by the injection of slugs of detergent. These wells are indicated in Fig. 1 by radial dashes.

Input Well HW-22 . . . Water injection into HW-22 was begun on April 3, 1953. The rate of water injection into this well was low and had shown a continuous decline during 1953 and 1954. Such a decline is common to input wells approaching fill-up on a lease where a delayed drilling program is used.[14]

During the forty-second week of 1953 an attempt was made to "break down" the formation by raising the wellhead pressure to 2,200 psi., but no increase in injection rate resulted.

First injection . . . A 10-gal. "slug" of Synthetics AF-100 was introduced into HW-22 during the sixteenth week of 1954. The results of the treatment are shown in Fig. 2, which presents the injection rate, pressure, and injectivity during 1954. On this and following figures, slug treatments are indicated by triangles and subsequent continuous detergent injection is designated by horizontal bars. The horizontal, cross-hatched bar denotes simultaneous injection of two detergents..

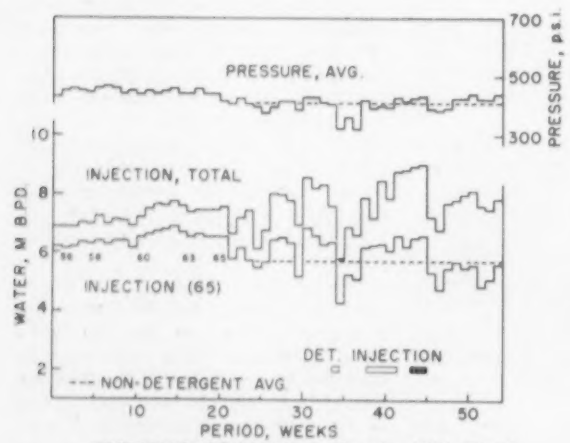
The injection of the 10-gal. slug of detergent into HW-22 had little effect on its performance. The average injection increased slightly for 4 weeks after the treatment, but the pressure also was slightly higher for this period. Then as the pressure began to drop, injection fell off sharply (weeks 21 to 24 inclusive).

The first period of continuous metering of detergent into this well had little effect on injection except that injection was maintained relatively constant despite a low-pressure period during this treatment. However, the second period of continuous detergent injection was accompanied by an increase in injection rate and injectivity.

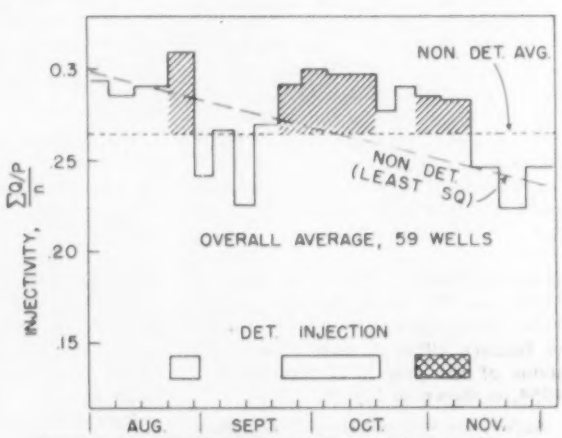
The injectivity (Q/P) is shown at the top of the figure. Part of this increase in injectivity may have been caused by the drilling of two new producing wells during the thirty-sixth and thirty-seventh week of 1954. When the pressure was increased sharply at the end of the fifty-fifth week, injection rose sharply, indicating that fill-up rather than plugging was the cause for the decline in water injection.

Other wells . . . The production of two old wells close to HW-22 was recorded and samples were obtained at intervals during and after the tests. No detergent has been detected in either the water or oil to date.

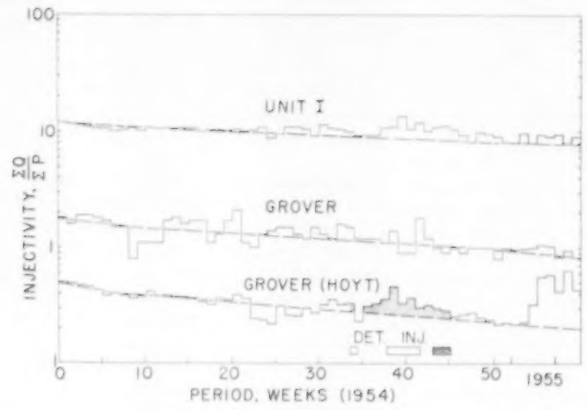
The oil production of one of the two old adjacent wells remained constant. However, the oil production of the other well increased from an aver-



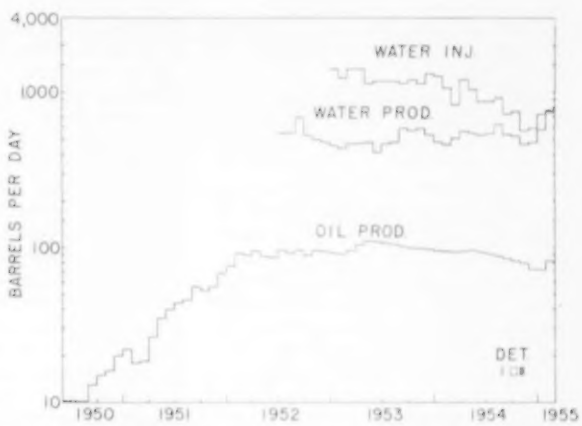
INJECTION RECORD of 65 wells, 1954. Fig. 4.



EFFECT OF DETERGENT injection on injectivity. Fig. 5.



INJECTIVITY of Grover, Grover (Hoyt), and Unit I. Fig. 6.



OIL, WATER production, and water injection of Grover lease. Fig. 7.

age of about 5 bbl. per day (during the first 4 months of the year) to 9 bbl. per day during the eighteenth week of 1954.

After this, the oil production increased slowly and remained at about 13 bbl. per day throughout the remainder of the year; water production rose from about 0.5 bbl. per day during the eighteenth week and averaged 5 bbl. per day the rest of the year.

Whether or not this marked increase in production was caused by the detergent slug treatment is not certain.

Input Well HW-49 . . . This well was completed and water injection was begun in October 1953.

This well was operated at full pressure, had a varied injection record, and had shown a marked decrease in injectivity during 1954. During the sixteenth week of 1954, a 10-gal. slug of detergent was injected into the wellhead, followed by 35 bbl. of water and a 24-hour shut-in period. Injection then was continued at full field pressure.

The average injection rate of this well had decreased from 140 to 25 bbl. daily at the same average pressure during 12 weeks preceding the treatment. The slug treatment resulted in a large injection increase. Injection then decreased regularly until after 7 weeks it was back to normal.

Dilute solutions . . . To test the effect of smaller, more frequent detergent injections, one-third gallon of 10 per cent detergent solution was introduced at the wellhead daily during the twenty-fourth through twenty-seventh weeks This injection was made at full field pressure each morning with a hand pump and required about 5 minutes. Sufficient detergent was injected to average 20 p.p.m. in the injected water.

Another slug treatment of the well was made during the thirty-first week. The well was not shut in except for a

TABLE 1—EFFECTIVE-PERMEABILITY VALUES AND SKIN FACTORS FROM PRESSURE-DECLINE TESTS IN FIVE-SPOT

Well number and time of test—	Input rate, bbl. per 24 hr.	Wellhead input pressure, psi.	Permeability, md.	Skin factor
Grover W-7—				
Before	42.9	765	2.4	—0.9
During	89.2	642	4.8	—2.8
After	43.2	630	2.8	—1.8
Grover W-9—				
Before	72.8	653	8.6	—0.7
During	81.7	540	8.7	—3.4
After	61.2	500	7.9	—3.3
Hoyt W-4—				
Before	24.6	735	1.6	+3.5
During	50.0	662	2.1	—1.0
After	39.3	700	1.7	—0.4
Hoyt W-5—				
Before	40.3	778	2.1	—1.0
During	50.7	715	2.8	—1.8
After	31.2	601	2.1	—1.4

TABLE 2—EFFECTIVE-PERMEABILITY VALUES AND SKIN FACTORS FROM PRESSURE-DECLINE TESTS AND RESULTS OF INJECTIVITY-INDEX TESTS IN GENERAL FIELD TEST

Well number and time of test—	Input rate, bbl. per 24-hr.	Wellhead input pressure, psi.	Permeability md.	Skin factor	Injectivity index, b.p.d./psi.
Grover W-5—					
Before	63.7	740	7.3	—2.9	0.22
After	28.5	630	2.9	—3.3	.23
Hoyt W-3—					
Before	85.7	725	15.7	—2.0	
After	50.3	700	5.6	—3.4	
Hoyt W-12—					
Before	40.0	795	1.8	—4.1	25
After	29.7	645	2.2	—4.0	32
Hoyt W-13—					
Before	167.0	620	8.9	—3.1	56
After	100.6	620	5.7	—2.5	41
Hoyt W-14—					
Before	111.0	366	6.4	—5.5	2.39
After	137.0	420	9.3	—5.2	2.39
Hoyt W-20—					
Before	155.0	685	9.7	—2.7	60
After	164.0	670	8.4	—4.0	53
Hoyt W-21—					
Before	25.4	688	2.6	—1.7	10
After	35.2	695	5.0	—1.0	.09
Hoyt W-22—					
Before	24.0	700	1.8	+0.2	.01
After	23.7	640	2.0	—1.5	.03
Hoyt W-23					
Before	63.3	575	5.6	—2.9	
After	68.0	545	6.5	—5.0	

half-hour period for this treatment. The detergent was introduced at full field pressure.

Results of the discontinuous metering of detergent into HW-49 are masked by a sharp decrease in pressure that occurred shortly after the test began. This also is true of the second slug treatment, except that a small increase in injectivity was noted immediately following the slug treatment.

Completion of an offsetting production well in the thirty-fifth week, 1954, did not materially affect the injection rates into this well. It should be noted that the new well is not a good producing well and is reported to be drilled into one of the "tight" areas of sand.

Pressure-decline-rate tests were made before and after the first slug of detergent was injected. The effective permeability of the formation was increased from 2.1 to 2.9 md. The skin factor changed from —2.9 to —3.6. This change indicated an increase in permeability of the zone around the well bore exceeding the increase in permeability of the formation as a whole. Therefore, the slug treatment with detergent achieved both local and formation improvement.

Pilot Test

The four input wells of a five-spot pattern in the Grover flood were selected for the pilot test. The wells included in the test were Grover W-7, Grover W-9, Hoyt W-4, and Hoyt W-5, indicated on the property map (Fig. 1) by the hatched area. Wells GW-7, HW-4, and HW-5 had low injectivity characteristics and were operated at full pressure. Well GW-9 had higher injectivity and the injection rate and pressure were controlled by an orifice.

Detergent was injected at concentrations of 60, 50, and 45 p.p.m. for 3 consecutive months beginning with the twentieth week of 1954.

The injection records of the wells in the five-spot generally show that an increase in injection, at pressures equal to or less than those existing prior to the test, resulted from metering small amounts of the detergent into the injection water. Wells GW-7, HW-4, and HW-5 were considerably improved by the detergent treatment, but the improvement was less marked for GW-9.

The records after the forty-fifth week are difficult to interpret because the field pressure decreased to the pressure-sensitive range for GW-7, HW-4, and HW-5.

Injection record . . . The average injection record for GW-7, HW-4, and HW-5 during 1954 is shown in Fig. 3. The records of the four wells of the five-spot pattern into which detergent was metered for 3 months are subdivided in this manner because the first three were "tight" wells, while GW-9 was a "loose" well into which injection was controlled. The injection of dilute detergent solutions into these three wells for an extended period resulted in a 34 per cent increase in injection although the average pressure during detergent injection was lower than that preceding the test. The effect appears to have been a temporary one.

A 10 per cent increase in injection was obtained for GW-9 as a result of using the detergent despite an average pressure decrease of 50 psi. below that for the reference period.

The average injectivity increase during detergent injection was 19 per cent. It appears that the tight wells, GW-7, HW-4, and HW-5, benefited more from detergent injection than did the loose well, GW-9.

Effective injection . . . The injection records show that the injection of about 50 p.p.m. of Synthetics AF-100 (weeks 20-23, Fig. 3) was considerably more effective than the injection of 20 p.p.m. (weeks 39-41) or the combination of 25 p.p.m. of Synthetics and 10 p.p.m. of Armour's Arquad T-2C (weeks 43-45) as part of the full-scale field test. Part of the decrease in injection from the thirty-seventh through the fifty-second week, however, undoubtedly was caused by the decrease in injection pressure.

The results obtained from pressure-decline tests on the four input wells in the five-spot test are given in Table 1. There was a temporary increase in effective formation permeability for each of the wells. The skin factor of each well showed permanent improvement because of detergent injection.

Full-Scale Field Test

The increases obtained in the pilot, five-spot test prompted tests of the effect of injecting detergent into all wells on the 720 acres of the property, comprising a total of some 90 input wells. Results of the test are shown in Fig. 4

Detergent injection was begun during the thirty-fourth week. During the first day (August 23), sufficient Synthetics AF-100 was metered into the intake line of the injection pumps to form a solution containing 150 p.p.m. of detergent. Detergent injection was continued at an average concentration of 45 p.p.m. for an 8-day period, then was stopped on September 1.

Detergent injection was resumed late in the thirty-eighth week. Synthetics AF-100 solutions containing an average of 20 p.p.m. of detergent were used during the thirty-ninth, fortieth, forty-first, and the first half of the forty-second week. Detergent injection was stopped on October 18.

A mixture of nonionic (Synthetics AF-100) and cationic (Arquad T-2C) detergents was injected during the forty-fourth and forty-fifth weeks at average concentrations of 25 and 10 p.p.m., respectively

Injection record . . . The injection record of 65 input wells is shown in Fig. 4. The number of wells completed prior to the field test is indicated by numbers across the figure.

A reference period was selected beginning with the twenty-fourth week of 1954 and extending through the second week of 1955, excepting periods of detergent injection, as indicated by the dashed line. This reference period was selected as the longest period after the newly completed wells (eighteenth week) had time to stabilize.

The field pressure during this period averaged 408 psi. and the average injection rate into 65 wells was 5,700 bbl. daily. During the detergent-injection period, the injection rate averaged 6,340 bbl. daily at 410 psi.

Injection increased . . . These average results indicate that over-all injection was increased 11 per cent by the detergent injection. It is difficult to evaluate the benefits of using the mixture of Arquad T-2C with AF-100 instead of the AF-100 alone because, during that injection period (forty-fourth and forty-fifth weeks), the pressure was above average.

The average injection rate was 6,480 bbl. of water daily at 428 psi. during this period. It appears that the effect of using both detergents was not large.

The 11 per cent increase in injection as a result of injecting detergent is considerably less than that observed with the selected five-spot (34 per cent). This may indicate that the solution used in the full-field test (about 25 p.p.m.) was too dilute.

The fact that water-injection rates increased during the first trial period, while the more concentrated detergent solution was being used, despite a decrease in pressure, also favors this conclusion.

Another effect that may have influenced the full-field results is that the five-spot test results indicated the tight wells were disproportionately sensitive to detergent treatment. The full field test included many loose wells.

The results obtained from the pressure-decline-rate and injectivity-index tests of some of the input wells involved in the general field test are given in Table 2.

Of the nine wells tested before and after detergent injection, an increase in effective permeability was obtained in five wells, and a decrease in four. The skin factors became more negative in five wells, less (or more positive) in

two, and remained essentially constant in two.

If the permeability of this zone remained constant while that of the formation as a whole decreased, the skin factor would become more negative. This is exemplified in GW-5, HW-3, and HW-20 wells. Well HW-23 is an example of a well in which the skin factor became more negative, while the permeability of the formation as a whole increased. This indicated an even greater increase in permeability around the well than in the formation.

Injectivity Calculations

Average injectivity values were calculated for wells of a narrow range of injectivity. This classification results in the following arrangement: (a) 14 wells operated at full pressure, Q/P less than 0.2, (b) 22 tight wells, Q/P less than 0.3, (c) 20 medium wells, Q/P between 0.3 and 0.7, and (d) 8 loose wells, Q/P greater than 0.7.

In each of the classes of wells, except in the eight loose wells, every injection of detergent was accompanied by an increase in injectivity. Injection rates into the loose wells had a steady decline except for periods of detergent injection. Most of this decline was the result of increased "pinching" of the loose wells in an attempt to maintain field pressure while the number of input wells was being increased. Part of the effect was caused by decreased field pressure.

Effect of injection . . . The effect of detergent injection on the average injectivity of 59 selected wells is shown in Fig. 5. This average excludes six of the wells previously discussed that were both erratic and extremely loose.

The normal decline in injectivity of the 59 wells is shown by the "least-squares" line. The injection decline appears to indicate pressure sensitivity of the field as a whole and an approach to "fill up" in at least a part of the field.

The effect of pressure sensitivity may result from changes in pressure in the nonlinear portion of injectivity-index curves or from averaging the results of dissimilar wells. Each detergent injection resulted in an increase in injectivity.

A summary of the effect of detergent injection according to classes of wells is presented in Table 3.

Reservoir fillup . . . Fig. 6 shows the effect of full-field detergent injection on input wells of the Grover unit, Flood Unit 1, and wells of the Grover exclusive of the north line wells which are supplied by the adjacent cooperating company. The failure of the pumps of the cooperating company resulted in an increase in the water supplied by Hoyt Oil Co. during first weeks of 1955.

The gradual decrease in the rate of injection, indicating reservoir fillup, is very apparent from these diagrams. Data from Unit 2 were not included because new input wells on that unit caused a general injection increase rather than decreases that accompany reservoir fillup.

Effect of Film Formation

Low concentrations of detergent in the water markedly decreased film formation between the crude oil and aqueous phases. This effect of detergents on film formation was observed recently with similar oils.[11] It is very likely that such films normally are formed during the water flooding of a reservoir since the flushing of oil from pore spaces must resemble the extrusion of drops from restrictions.

Such film formation would be expected to hinder water flooding because of the tendency of the films to block small pores and to require extra energy for expansion.

No detergent was detected in samples of oil collected throughout the test although interfacial tensions by the pendent-drop method would be sensitive to very small concentrations of detergent. Measurements of the surface tensions of produced water samples also indicated that no detergent has yet moved through the formation.

Oil Production

The production record for the 80-acre Grover lease is presented in Fig. 7. Oil production increased sharply in 1951 as a result of the water flood. Maximum daily oil-production rate was obtained in May 1953 and thereafter declined steadily.

An appreciable change in oil-production rate occurred during November and December 1954, and January 1955, followed by a marked increase in February. The amount of water injected during November, December, and January was considerably less than that injected in preceding months. In February, the amount of water injected into this lease was increased by the installation of a third pump to maintain line pressure at 1,000 psi.

It is not possible to determine the proportion of the oil-production increase caused by detergent injection and that by increased water injection at higher pressures.

The rate of oil production from Flood Unit 1 is still increasing because of the recent development of this flood. Therefore, effects of the detergent injection on production of oil from this unit cannot be determined.

Acknowledgments

The cooperation of personnel of the Hoyt Oil Co. in furnishing the property on which the described tests were made and comprehensive data concerning the property and that of Hercules Powder Co. in supplying the detergent used in the field tests is gratefully acknowledged.

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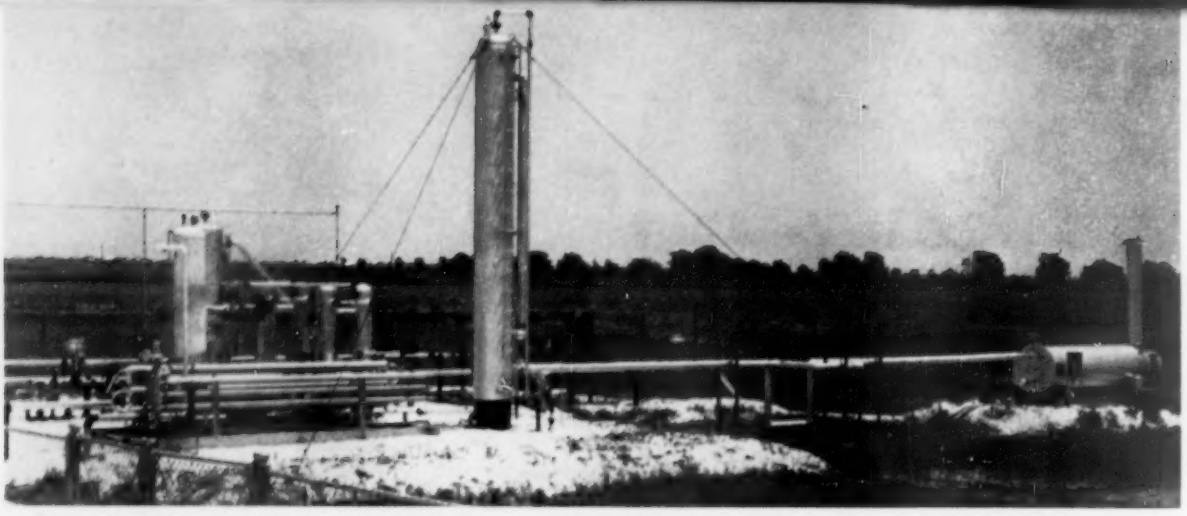
TABLE 3—EFFECT OF DETERGENT INJECTION ON INJECTIVITY OF VARIOUS CLASSES OF WELLS

Classification—	Full pressure	Tight	Medium	Loose	Full field
Q/P range	0.2	<0.3	0.3 to 0.7	>0.7	0.01 to 2.0
No. of wells	14	22	20	8	59
Q/P:					
Nondetergent	0.101	0.197	0.418	0.818	0.267
Detergent	0.110	0.221	0.453	0.885	0.295
Amount increase	0.009	0.024	0.035	0.067	0.028
Percentage increase	8.9	12.2	8.4	8.2	10.5



COLD-FEED STABILIZER, operated at high pressure, is used here with a low-temperature separation unit. Fig. 1.

ELEMENTS OF FIELD PROCESSING—6

Stabilization of Separator Liquid

by Dr. John M. Campbell

THE processing of separator liquid by stabilization has become increasingly common in the past 5 years primarily because of the widespread use of low-temperature separation equipment. However, more use is being made of stabilization where normal temperatures prevail even though it is harder to justify the higher expense.

A stabilizer is nothing more than a fractionation column designed to selectively separate the components without undue loss of salable components. In many details it is identical to the fractionation towers used in gasoline plants and refineries. In general, though, it utilizes simpler controls and a direct gas-fired source of heat.

Desirable features . . . Any stabilizer for field use should generally have the following features:

- Be self-contained in that the only utilities needed are those readily available, i.e., natural gas and sometimes water and/or electricity.
- Be reliable and capable of operating continuously with only periodic attention.
- Have a simple and reliable control system that may be easily adjusted, and to a certain extent maintained, by the average lease pumper and switcher.
- Be able to handle widely fluctuating quantities of fluid of varying composition.
- Be readily installed and dismantled in the field.

Author is with school of petroleum engineering, University of Oklahoma, Norman.

General Characteristics

There are three basic types of stabilizers now being used:

1. Conventional reflux type, operating at pressures from 150 to 300 psia., using water or refrigeration-cooled reflux condensers.
2. High-pressure nonrefluxed "cold-feed" stabilizers, operating at pressures of 150-300 psia., with the feed entering at or near the top.
3. Same as (2), except that the operating pressure is from 40 to 70 psig.

There is nothing unique about the first type. It is nothing more than a regular gasoline-plant-type tower adapted for field use. The reflux system complicates the control system somewhat, increases cost, and usually requires the availability of water. Consequently, types (2) and (3) are used wherever possible.

Cold-feed units . . . The cold-feed stabilizers have many limitations, but they are ideally suited for many field stabilization problems. Consequently, a large number of them are now in use. The remainder of this article will concern this type since refluxed stabilizers have been widely discussed in the literature.

Fig. 1 is a view of a high-pressure cold-feed stabilizer used in conjunction with a low-temperature separation unit in the Gulf Coast area. The liquid from the low-temperature separator enters the tower about 2 ft. from the top, the overhead line shown carrying the gas evolved in the tower. Heat is furnished by a gas-fired heater similar to a standard oil-field heater, except that Du Pont "Hi-Tec" salt is used as the liquid instead of water.

Fig. 2 is a schematic sketch of such a stabilizer with an inset showing a common method of handling reflux when such is needed.

The head necessary to force the liquid through the salt-bath heater is furnished by taking said liquid off a chimney tray part way up the tower. This has the obvious disadvantage of increasing tower height.

Fig. 3 is a schematic sketch of a low-pressure cold-feed stabilizer using a 15-psig. gas-fired steam generator as a source of reboiler heat. In this unit, the reboiler may either be incorporated in the base of the tower or be a separate vessel.

Stabilizer Design

The cold-feed stabilizer in reality is nothing more than a stripping column in which the feed is cold enough to prevent undue loss of stock-tank components overhead. Obviously a flash takes place in the top of the tower that to some degree is comparable to a flash in a separator. So there is obviously a limit as to how high the feed temperature may be without encountering undue losses overhead.

Since the losses gradually increase as feed temperatures are raised, there is no one critical temperature. But field experience has shown that the temperatures should be not greater than those shown in Fig. 4, for best results.

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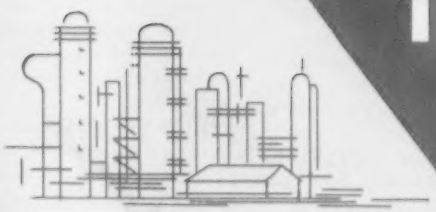

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From Fig. 4 it may be deduced that the high-pressure tower experiences a lower stock-tank-liquid loss than the low-pressure unit, with the same feed temperature. Field experience has borne this out, and it is possible to reach the same conclusion by examination of vapor-liquid equilibrium ratios.

Tower operation . . . It is really necessary to understand what takes place in the tower to realize the limitations and general characteristics of the unit. The cold feed is fed on or near the top tray of the tower where it contacts the vapor rising from the tray below. Because the liquid is much colder than this vapor, a very unstable condition exists. Heat exchange takes place between the two streams, and part of the liquid, including heavy ends, vaporizes while a portion of the vapor is condensed.

Because of the large temperature differential, causing this instability, a good separation of stock-tank and nonstock-tank components does not take place on the top few trays. As the methane, etc., pass down the column, the temperature finally gets high enough to vaporize it. This material then passes up the tower as vapor until a portion is condensed by the cold feed. If this recycle is allowed to continue, the amount of vapor gets out of proportion and the column may only remove this condition by "burping"—i.e., relieving this vapor load overhead during which liquid is also lost.

For all practical purposes, the temperature is fixed at both ends of the fractionator when the feed is at constant temperature. The ratio of feed to vapor on the top tray is large, so that the temperature of the vapor leaving the tower is very dependent on the feed temperature, particularly at low pressures. It is this, which is contrary to good tower design, that accounts for burping.

Pressure sensitivity . . . It is for this reason that cold-feed towers are pressure sensitive—i.e., their separation efficiency varies markedly with pressure. The adjustment problem is simply to adjust the pressure so that most of the noncondensables are lost overhead during the initial flash without excess loss of stock-tank material.

There are almost an infinite number of pressure and temperature combinations that will work—that will give the desired product—yet the optimum range is relatively narrow. It is probably for this reason that relatively few of the field stabilizers that the author has had the opportunity to examine have been set to yield optimum recovery.

A change in feed conditions will sometimes upset the tower and cause it to become unstable. For this reason, I believe it is wise to locate the feed point several trays from the top. Much of the entrained liquid will be caught on these trays, particularly if the tower burps. The upper portion of the tower in effect acts as a scrubber for the overhead gas.

Because of this possibility of overhead liquids, some form of scrubber should always be used when the overhead gas is used as fuel.

A detailed analysis of the cold-feed stabilizer will yield the opinion that it is a relatively inflexible piece of equipment when compared to refluxed units. But it is an excellent piece of field equipment because of its simplicity.

Pressure vs. recovery . . . If column pressure is plotted versus stock-tank recovery for actual field data, the curve drawn through the points would go through a maximum, the exact point depending on the feed composition and the product desired. The reasons for this are many and complex.

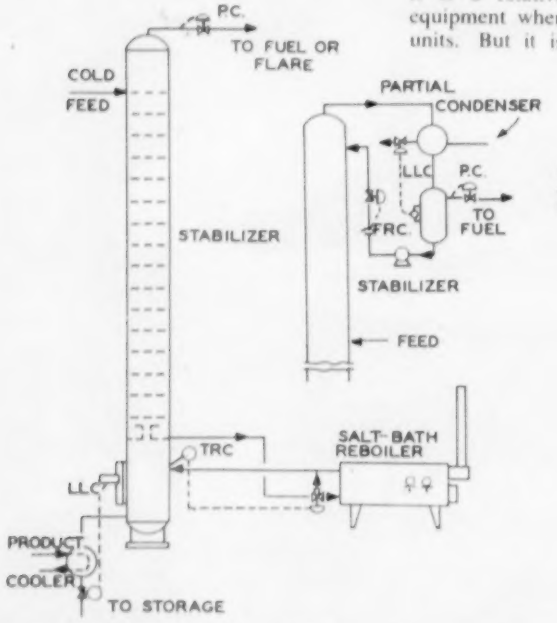
The simplest general explanation is that the initial flash loss is inversely proportional to pressure. But as the pressure is raised, higher reboiler temperatures are required, which in turn makes the overhead temperature higher. At low pressures the flash loss is controlling while at higher pressures the reboiler temperature becomes more significant.

It is partially because of the higher temperature gradient along the column that high-pressure stabilizers are generally taller. Most high-pressure towers have 20 bubble trays or the equivalent packing while low-pressure units have 10 to 12. Ten to twelve trays are enough for many stabilization jobs up to 200 psia. if the tower is carefully adjusted.

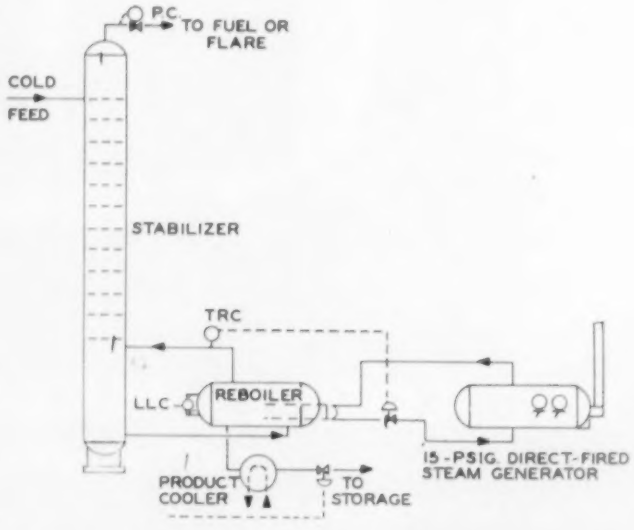
Fig. 5 shows a typical temperature-gradient curve when processing 0° F. feed in a 20-tray tower while making a stable stock-tank product.

Most manufacturers use packed columns of up to 20-in. diameter and bubble tray for all larger sizes. Stabilizers are sized in accordance with established techniques, the liquid loading normally being the critical factor. However, it is always advisable to check vapor loading.

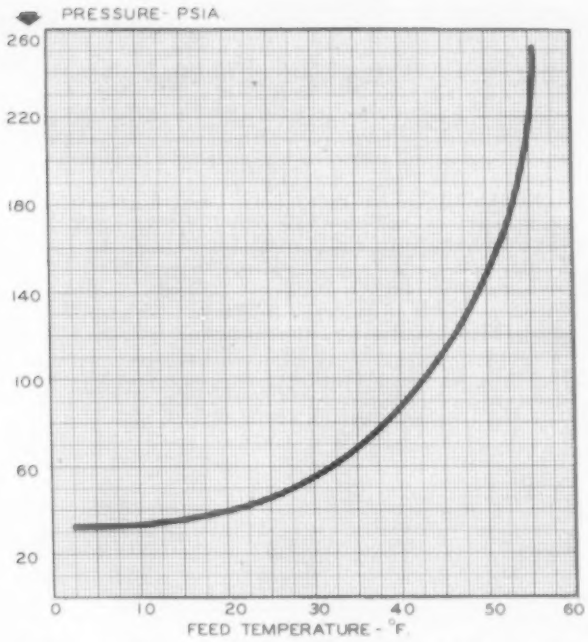
As a rule of thumb, a properly de-



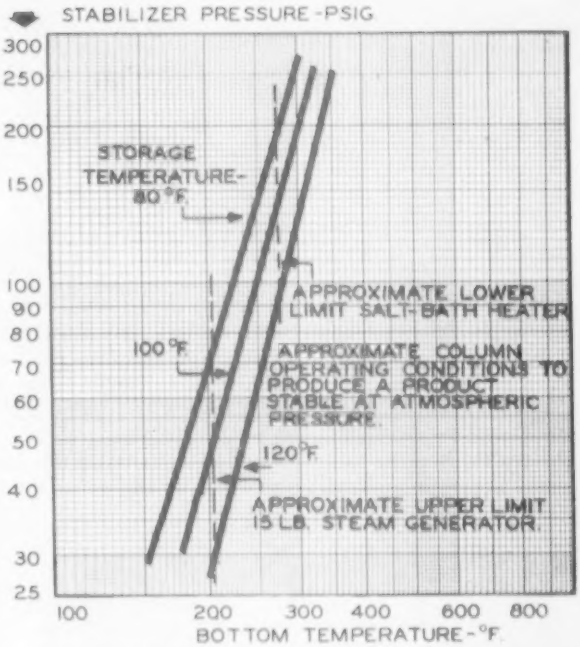
HIGH-PRESSURE cold-feed stabilizer operation. Insert shows method of handling reflux. Fig. 2.



LOW-PRESSURE cold-feed stabilizer using a gas-fired steam generator for reboiler heat. Fig. 3.



MAXIMUM FEED TEMPERATURES recommended for operation of nonrefluxed stabilizers. Fig. 4.



LIMITS of column pressure and reboiler temperature to stabilize a product for storage at various temperatures. Fig. 6.

signed stabilizer will handle about 100 bbl. of stock-tank liquid per square foot of column area. With a feed of 20° F. or less, over 95 per cent of the stock-tank liquid in the feed will normally be recovered in the tanks.

Cold Feed Deethanizer

Some field installations use more than one tower in order to produce propane or L.P.G., or both, in addition to oil or gasoline. Where mechanical or expansion refrigeration has been used, a cold-feed deethanizer has sometimes been specified. When used in this manner, the tower is normally operated at 350 to 400 psia. The results of this have at best been uncertain, with most of the experiences being at least partially unsatisfactory.

The separation in a cold-feed column is a "sloppy cut" by fractionation standards although satisfactory for stabilization. Deethanization, on the other hand, requires a close cut between ethane and propane. Experience has shown that it is difficult if not impossible to get efficient deethanization in a cold-feed tower without losing excessive propane.

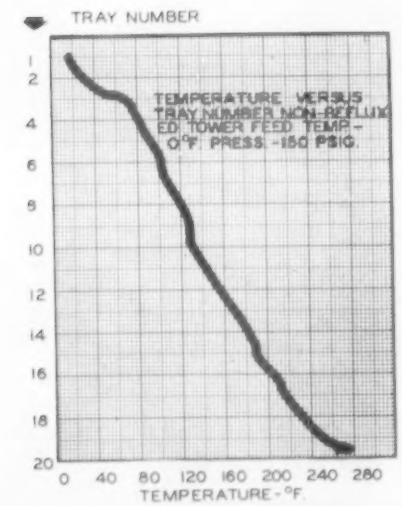
Table 1 is the result of an actual test on such a tower, and illustrates typical results obtained. The feed came from a low-temperature separator operating at 0° F., after passing through a surge vessel. About 14 per cent of the entering ethane is carried out in the bottoms, even though 13 per cent of the propane is lost. In this instance the quantity of propane lost may be reduced only by removing less ethane.

As a result of similar experiences, I believe that the cold-feed deethanizer only has good application in those cases where L.P.G. is being produced and when an excess quantity of propane is present (lost anyway). Otherwise it is necessary to add butane to the "commercial propane" to compensate for the surplus ethane if the column is operated to reduce propane loss. Such a fluid meets only the vapor-pressure standards of true commercial propane.

Reboiler Design

The reboiler normally used with the low-pressure stabilizer is a 15-psig.-working-pressure, gas-fired steam generator. Since steam at this pressure has a saturation temperature of 250° F., a reboiler temperature of 200° F. represents a practical controllable maximum when using this system.

Examination of Fig. 6 shows that the column pressure may not exceed 50-70 psig. in the average application. This



TEMPERATURE GRADIENT in a 20-tray high-pressure cold-feed stabilizer. Fig. 5.

TABLE I—COLD-FEED DEETHANIZER MATERIAL BALANCE

	Feed—17,550 gal. per day		Overhead—0.224 M.M.c.f.d.		Bottoms—12,600 gal. per day	
Comp.	Mole per cent	Moles/ hour	Mole per cent	Moles/ hour	Mole per cent	Moles/ hour
C_1	17.47	11.88	48.02	11.88		
C_2	16.41	11.16	38.98	9.61	3.58	1.55
C_3	28.94	19.66	10.29	2.54	39.60	17.12
iC_4	2.91	1.98	0.62	0.15	4.22	1.83
nC_4	16.78	11.40	1.58	0.39	25.40	11.01
iC_5	3.38	2.30	0.19	0.05	5.20	2.25
nC_5	6.08	4.14	0.12	0.03	9.50	4.11
C_6	4.47	3.06	0.12	0.03	6.98	3.03
C_{7+}	3.56	2.42	0.08	0.02	5.54	2.40
	100.00	68.00	100.00	24.70	100.00	43.30

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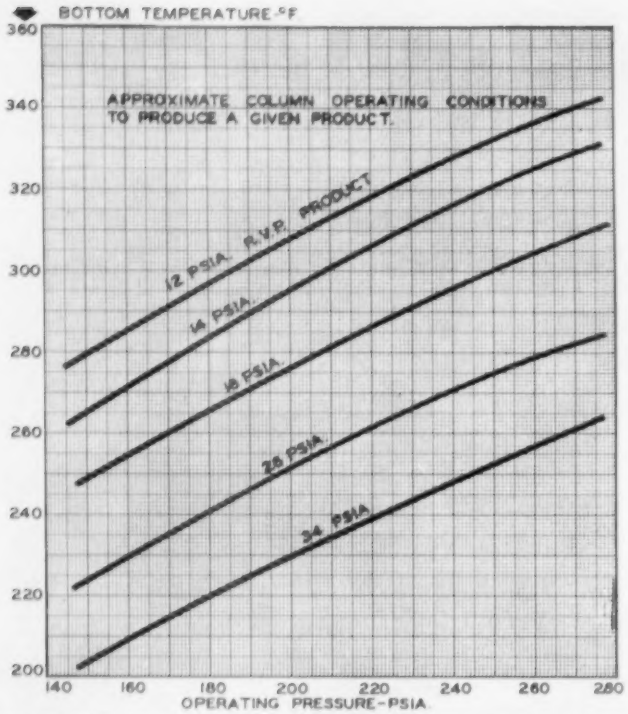
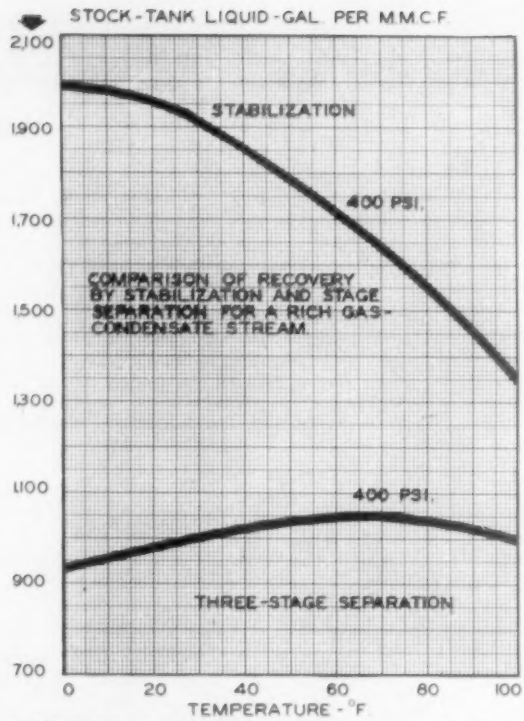


STABILIZER operating conditions to produce products with various vapor pressures. Fig. 7.

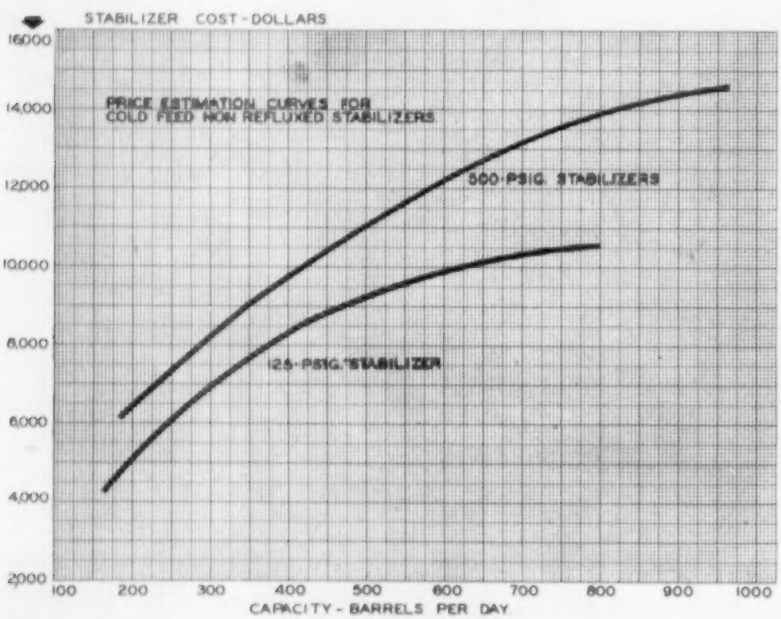


ADVANTAGE of using stabilization on a rich gas-condensate stream. Fig. 9.

obviously limits the flexibility of the unit.

A pressure of more than 15 psig. may not be used without bringing the steam generator under the boiler ordinances of the states. In most states, such boilers must be attended 24 hours a day, which is obviously impractical in the average lease situation.

The reboiler shown in Fig. 3 may be external, as shown, or be mounted in the column proper. If the latter is done the column is usually larger in diameter at that point. In either event, the reboiler must have enough elevation to allow the steam condensate to return to the steam generator if a condensate pump is not used.



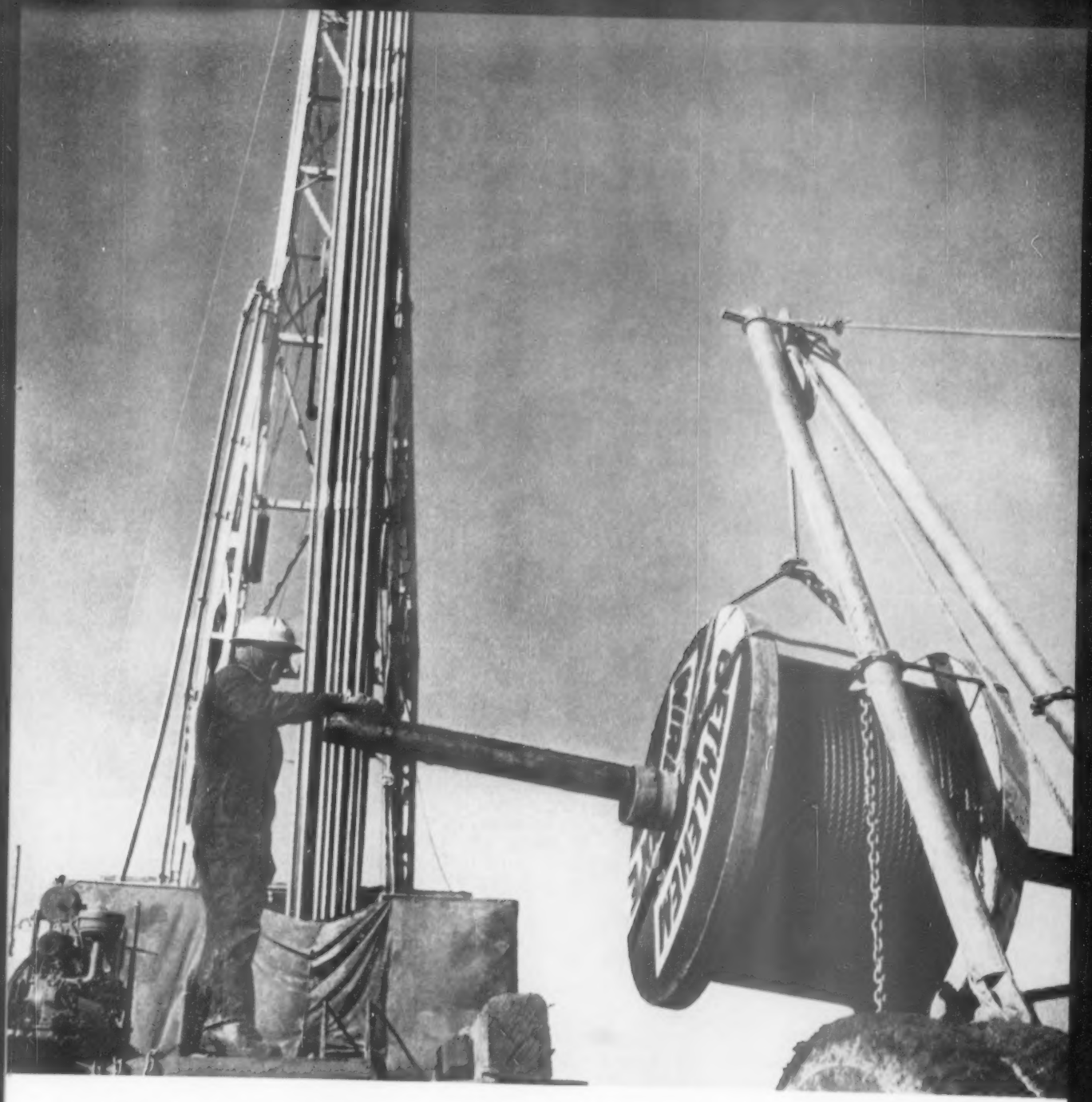
COSTS of cold-feed nonrefluxed stabilizers for high and low operating-pressure ranges (as of May 1955). Fig. 8.

Temperature control . . . Effective and accurate control of temperature is obtained with the temperature-control valve in either the condensate or vapor line.

The reboiler for the higher-pressure stabilizer is usually a salt-bath heater, which is nothing more than a regular oil-field indirect heater modified for use with salt. This eutectic salt, previously mentioned, is composed of 40 per cent sodium nitrite, 7 per cent sodium nitrate, and 53 per cent potassium nitrate. It becomes molten at about 288° F. It is stable and substantially nonvolatile up to 850° F., and therefore may be used with safety in this application.

The primary disadvantage of this system is the control problem presented. The salt must be maintained at a substantially constant temperature because it is impractical to control the heat input by varying salt temperature because of the large inert mass involved. Consequently, the heat input to the tower is varied by bypassing a portion of the liquid around the reboiler. Experience has shown that best control results when a three-way valve is used close to the heater. This allows better mixing of the fluids before reentering the tower.

The drawbacks to this system are obvious, but for the most part it is very satisfactory for stabilization. It should be used with caution, though, for more exacting fractionation.



Wire Rope at Work—They were at 6100 ft, out in the North Sherman Field, Grayson County, Tex., when this photograph was snapped. Excellent progress had been made, and an ultimate depth of 9100 ft was expected. The rig, which is equipped with a 126-ft portable mast, belongs to Alan Drilling Co., Wichita Falls.

As the picture indicates, they didn't intend to be handicapped by a lack of wire rope. That brand-new reel contained 3500 ft of Bethlehem 1⅛-in. rotary line, 6x19 Seale. It was in good hands, you might say, for the winch line carefully easing it down to the ground was also a Bethlehem rope, ⅞-in. 6x31. These are two types of Bethlehem lines widely used in the oil fields, where they have proved their reliability and stamina for many years.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

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The problem of time lag with this control system has been partially offset by using controllers with an accelerated response. (Control problems such as this will be discussed in more detail in a part to follow.)

Reboiler systems using Dowtherm, Paracymene, high-pressure steam, etc., are not commonly seen in field stabilization systems to date.

Proper reboiler temperature . . . Figs. 6 and 7 are convenient to use as a guide in estimating the proper reboiler temperature for a given column pressure. Fig. 6 gives the approximate temperature needed to obtain a product stable in atmospheric storage at three different storage temperatures. The vertical dashed lines show the rough limits of each of the reboiler systems. The lower limit on the salt-bath heater is predicated on having a 50° F. differential between the salt temperature and the tower bottoms.

Obviously, a change in this differential will affect the limiting temperature. The salt bath should not be used below about 325° F. to insure that all is molten.

Between 200° and 270° F., an indirect heater using heat-transfer oil may be used. However, when making this product, the tower pressure is usually held within the temperature range of the 15-lb. steam generator or the salt-bath heater.

Fig. 7 is used when a product with a given Reid vapor pressure at 100° F. is desired. The 14-psi.-R.v.p. line roughly coincides with the 100° F. line in Fig. 6.

The actual temperature needed is the bubble-point temperature of the bottom product at column pressure. Since this is a function of composition, it is not possible to always predict the temperature accurately using the type of curve shown. Experience has shown, though, that these curves are convenient for making preliminary settings.

Stabilizer Cost

Although stabilization is superior to stage separation from a process standpoint, its use must be justified by economics. Fig. 8 is convenient for estimating the cost of stabilization equipment, including all necessary accessories. About 20 to 30 per cent should be added to the costs shown to cover transportation and installation. Stage-separation prices may be estimated by reference to Parts 1 and 5 of this series.

It is often difficult to justify the additional cost of a high-pressure stabilizer on the basis of concrete facts because it is difficult to differentiate between the recoveries to be obtained with the two models. On the basis of experience, though, I usually recommend the high-pressure model because of its greater flexibility, adaptability, and generally higher recovery. In the final tabulation of over-all well cost, the additional cost here has little effect.

Applications . . . It is difficult to accurately predetermine those places where a stabilizer will show significant advantage over stage separation. Stabilization will, however, generally show advantage in any of the following circumstances:

1. First-stage separation temperature is between 0° and 40° F.

2. First-stage separation pressure is greater than 1,200 psig.

3. Stock-tank liquid gravity is greater than 45° A.P.I.

4. It is known that the oil contains large quantities of pentanes plus, even though the gravity is not abnormal.

5. A product with controlled specifications is desired (ethane-free, propane-free, etc.).

Fig. 9 illustrates the advantage of using stabilization on the liquid separated from a gas-condensate system at 400 psig. The advantage is particularly pronounced on rich gas-condensate systems of this type.

Although the benefits are more pronounced with such systems, stabilization of crude oil often proves advantageous. It is expected that more widespread use will be made of this medium in the future.

The gas passing overhead from the stabilizer may be used as fuel for the reboiler and any adjacent gas-fired equipment. When processing a liquid separated at 0°-20° F., the gas overhead is normally 5 to 8 per cent of the total well stream, both expressed in standard cubic feet.

Errata

Part 1, The Oil and Gas Journal, March 14, 1955, p. 110, left column, next to last paragraph should read "0.1 gal. per 1,000 s.c.f." instead of 1 gal. per 1,000 s.c.f.

Part 3, The Oil and Gas Journal, May 9, 1955, p. 118, left column, third paragraph from bottom should read "Below —15° to —20° F. steel rapidly etc." instead of as shown.

BOOKS

AN INDEX TO THE GENERA AND SPECIES OF THE FORAMINIFERA. By Charles Davies Sherborn. Published by Smithsonian Institution, Washington, D. C. 485 pp. $3.50.

This is an offset reprint of this monumental reference work, long out of print, which was originally published by the Smithsonian Institution in 1893 and 1896 in two parts. It includes all species and genera of Foraminifera published in 1889, giving both the original names and any new combinations used by later authors, as well as literature citations. Systematic work on Foraminifera during the past 40 years has received a tremendous impetus from their economic value, especially that concerned with the search for petroleum and more recently with ecologic and paleoecologic studies. Because of the daily increasing volume of published material, it is difficult to keep abreast of nomenclatural changes in current work. Recently, Dr. Hans E. Thalmann, of Stanford University, completed for publication an index of the Foraminifera from 1890 to 1950. This work continues the earlier work by Sherborn, bringing it up to date, but does not repeat the material of Sherborn's book. With the forthcoming publication of Thalmann's index and with the present reprinting of Sherborn's classic index, modern students will now have available an invaluable tool in their systematic work on the Foraminifera.

GEOLOGY OF SOUTHERN CALIFORNIA, BULLETIN 170. Published by Division of Mines of California, Ferry Building, San Francisco. $12.

This report consists of 10 chapters, 5 geologic road guides, and 34 separate geologic maps with brief texts. It was prepared in cooperation with an organizing committee of the Geological Society of America. The committee was assisted by 103 contributing authors. It is a comprehensive treatise on every phase of the geology and mineral resources of southern California. It should provide basic information of great value and broad scope in the study of all mineral resources, engineering problems, oil and gas developments, and other activities where minerals are utilized. Each chapter and each road guide is presented as a separate booklet. The 15 booklets and an envelope containing the 34 maps are mailed in a cardboard box.

CHEMICAL ENGINEERING COST ESTIMATION. By Robert S. Aries and Robert D. Newton. Published by McGraw-Hill Book Co., 330 West Forty-second Street, New York.

This book is a practical, quantitative treatment of timely importance and aid to chemical engineers, chemists, accountants, market analysts, and other executives in industry who are concerned with estimating costs of new units or complete plants as well as costs of manufacturing. The aim is to outline the principles of cost estimation, and then to provide quantitative data for application of the techniques discussed to solving problems encountered in modern industrial practice. The book is geared to aid management in extracting from project reports the necessary information to prepare an economic estimate. It also serves in helping the engineer bridge the gap between technical details of the project and economic factors—to give management economic perspective on which the ultimate decision is based. With the book the engineer can give a quick answer when an executive asks for a cost estimate, and also a more complete answer requiring more time.

LADY DRILLER. By N. Elizabeth Mills. Published by Exposition Press, Inc., 386 Fourth Avenue, New York City. $3.

This is an autobiographical account of experiences of a woman who braved a man's world to become the only woman oil and gas contractor and drilling operator. In vigorous, forthright and down-to-earth style, she relates the true story of a genuine individualist.

DRILLING DATA—PHILLIPS PETROLEUM CO. 1 STURR

Depth	Days since spud	24-hr. footage	Liner size	Bit nozzles	S.p.m.	Rotary (r.p.m.)	Weight on bit	No. of drill collars	Mud visc.	Mud weight	Pump pressure	Bit No.
7,000	17½	93	7¼	3—11	54	85	50,000	19—6¾			1,400	
8,000	23	164	6¾	3—11	56	80	50,000	19—6¾	Water	Water	1,200	
9,000	32	77	6¾	3—11	58	51	50,000	19—6¾	52		1,250	50
10,000	39	135	6¾	3—11	56	78	25,000	19—6¾	74	9.6	1,650	57
11,000	43	58	6¾	3—11	54	71	35,000	19—6¾	110-15	9.8	1,700	58
11,500	60	103	6¼	3—11	59	68	30,000	18—6¾	116	9.8	1,500	78
12,000	68	68	6¼	3—11	58	67	35,000	18—6¾	90	9.6	1,190	83
12,400	80	37	6¼	3—11	47	48	35,000	18—6¾	109	9.8	1,400	96
12,600	90	38	6¼	3—11	53	50	40,000	18—6¾	132	9.8	1,600	105
13,000	99	93	6¼	3—11	52	50	40,000	18—6¾	119	9.9	1,600	116
13,362 (TD)	107	42	6¼	3—11	53	51	40,000	18—6¾	124	9.8	1,650	123

Spud: 7-19-54. Rig released: 12-8-54. Base of Oil Creek at 13,295 ft.

Drilling Time at Bradley Reduced 83 Days

by Norman S. Morrisey

In spite of the complex geology, wells at Bradley are completed in 100-120 days.

DRILLING time in deep Bradley field, Garvin County, Oklahoma, has been reduced from 190 days on the discovery well to 107 on later wells. Much of this increase can be directly attributed to the use of larger engines and bigger and better pumps although considerable time on the discovery well was spent in coring.

Phillips Petroleum Co. was able to drill its 1 Sturr in 107 days using a company rig. Total depth on the well was 13,362 ft. and the well was completed in the prolific Simpson sands.

In drilling the hole, Phillips used seven to twenty 7-in. drill collars in a 9-in. hole using 5-in. drill pipe. The rig was a National 100 powered by three 510-hp. engines; the company used an E-700 National pump with a C-350 standby.

Few drilling problems were encountered while drilling the well. There is a tendency for crooked holes to develop in the Springer shale and operators combat this by reducing weight and cutting down on their drilling time to about 3 ft. per hour. Simpson sands, the main pay zones in the area, are hard to drill through and some of the wells have cored almost the entire Simpson section.

Experience has shown that a high-viscosity mud does the best job in keeping the hole in good condition. Phillips uses an oil-emulsion mud; and to help the geologists a nonfluorescing oil or live crude is used so that oil shows can be recognized. Customary practice in the deep area of Bradley is to set 1,200 ft. of surface pipe and then run oil string to total depth at around 13,700 ft. On the Phillips 1 Jade the operator cored the entire Simpson section from 11,800 ft. to total depth (except for about 150 ft. of shale). This was nearly 2,000 ft. of cores. Phillips spudded the Jade on October 12, 1954, and completed the well 190 days later at a total depth of 13,716 ft. On the Jade, Phillips set an intermediate string at 10,540 ft. through the Springer shale so that the hole would be in good shape for the later coring program. After reaching total depth, Phillips ran 7-in. pipe and completed the well through perforations.

In drilling the first 5,000 ft., rotary-table speeds of 190 to 200 r.p.m. were used but below this depth operators slowed down to about 75 to 80 r.p.m. at 10,000 ft. Bradley drilling has shown that automatic drillers give very good results for the area. Although blowouts are not a present problem, Phillips used hydraulically controlled blowout preventers.

Mud controls . . . The usual practice is to drill with native mud to around 8,800 ft. The mud program is then changed to controlled mud, either an oil-and-water-emulsion mud (conventional emulsion) or a Driscose-base low-solids mud. This type of oil-emulsion mud calls for an 8 to 10 per cent oil by volume.

Geology of Bradley district . . . The Bradley district lies on the northwest edge of the Pauls Valley uplift and north of the complexly folded and faulted Carter-Knox-Doyle trends. Production is from the Simpson sands. In parts of the field the Springer sands have been preserved below the middle Pennsylvanian unconformity and produce.

At Simpson level the field is a very complexly folded and faulted structure. Within the Simpson several zones produce: Bromide and McLish and Oil Creek sands are the principal ones. Wells have logged over 300 ft. of MicroLog pay and these sands make a very attractive target even at depths of 13,000 to 14,000 ft. Several wells have been drilled to the Arbuckle limestone but have not penetrated any great distance into this formation.

There is a strong possibility that the field may be extended since its outlines have not yet been completely defined.

PUMP STATION and camp as seen from tank farm on hill. (U. S. Army photo.)

Alaskan Pipeline Joins Nation's Defenses

This 625-mile 8-in. products artery has a maximum capacity of 12,000 bbl. per day. Cost was $40,000,000. Pipe laying was finished last year, and station construction in 1955.

by Paul Reed
Pipeline Editor

PORTABLE PUMP used in the pressure testing of the line. (U. S. Army photo.)

THE final testing of the Army's Alaskan products pipeline has recently been completed. Now that reports of tests are available, together with later information from engineers and constructors, it is possible to know more about how this strategic system was built for Arctic operation.

The Army's 625-mile, 8-in. products line from the ice-free port of Haines to Fairbanks, Alaska, runs up from the coast into Canada where it extends for 270 miles before it reenters Alaska. Construction of the $40,000,000 system with maximum capacity of 12,000 bbl. per day was undertaken in 1954 and 1955 (*The Oil and Gas Journal, November 1, 1954, page 99 and June 20, 1955, page 65*). Pipe laying was done last year and station construction was finished this year.

Two spreads laid the line—one in Alaska and the other in Canada. During the peak of construction 775 men were employed. The project was built by Williams Brothers Co. in association with McLaughlin Construction Co. and Marwell Construction, Ltd. After

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Standard has built 4 catalytic reformers in the West to make these cleaner-burning, more powerful motor fuels required for best performance of today's higher compression engines. This program was two years in planning and building—cost $50 million.

This $50 million worth of plants is only part of the $350 million Standard is investing this year to make petroleum more useful and plentiful. Some of it will go for product research, part will pay for new manufacturing facilities. A good share will finance the search for new sources of oil to help supply the 733 gallons a year per person that go into thousands of oil-born products essential to modern living.

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completion of hydraulic testing in the middle of August, it was operated by Williams Brothers until it was taken over by the Army for operation by civilian personnel.

Later installations . . . After the main construction of the system had been completed, certain changes were made this year.

Four more scraper traps were provided so that scrapers could be removed at 100-mile intervals instead of at the 200-mile intervals specified in the original plans.

Installation of these scraper traps presents a problem of line drainage and isolation of liquid and vapors preparatory to cutting and welding operations. To minimize both drainage and hazard, Williams Brothers uses a pair of 8-in. stopples as temporary block valves. The stopples will be installed through split tees welded to the line upstream and downstream from the cutout points. Upon completion of the job, Lock-O-Ring plugs will be installed to permit removal of the tapping valves, leaving only a blinded flange connection on each split tee.

Bypasses with bleeder valves were installed recently at main-line gate valves and check valves. These furnish additional takeoff connections which would be available for pumps or pressure gages. The bypasses at check valves would facilitate draining the line or pumping in a reverse direction.

Pipe . . . Seamless pipe was used throughout the project. The principal part of the line was 617 miles of .277-in. wall. The remaining 8 miles was pipe of .312-in. wall. Of this latter amount of pipe, 19,711 ft. was for the discharge side of Station 2, which is 40 miles east of the port of Haines. It pumps from an elevation of 1,300 ft. to Station 2-A at an elevation of 2,773 ft. over a distance of 103 miles. The maximum elevation on the line is 7,750 ft. in the Coastal Range at Mile 55—15 miles beyond Station 2. Maximum station discharge pressure is 1,450 psi. at Station 2-A.

The remaining 23,136 ft. of the .312-in. wall pipe was used for river crossings.

Pipe was of low-carbon steel—0.215 maximum carbon, check analysis, running principally 0.14 to 0.205 carbon. American pipe was furnished for the Alaskan section and British pipe for the Canadian section.

Welding . . . The welding output of the Alaskan spread working 6 days a week averaged 1,675 joints (70,330 ft. per week or 278 joints per working 12-hour day).

The Canadian spread operating with

DITCHING MACHINE with special small-sized wheel with closely spaced buckets. Drag line with clam shell follows. (Photo by Caterpillar Tractor.)

BOOM CAT with spring-mounted bending shoe at base of A-frame. This is one of two tractors lining up pipe for pipe gang. (Photo by Caterpillar.)

H-FRAMES driven 55 ft. into stream bed support pipeline at crossing of a swift mountain stream. (U. S. Army photo.)

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DOZER pulling construction vehicle out of flooded part of right-of-way in Yukon Territory.

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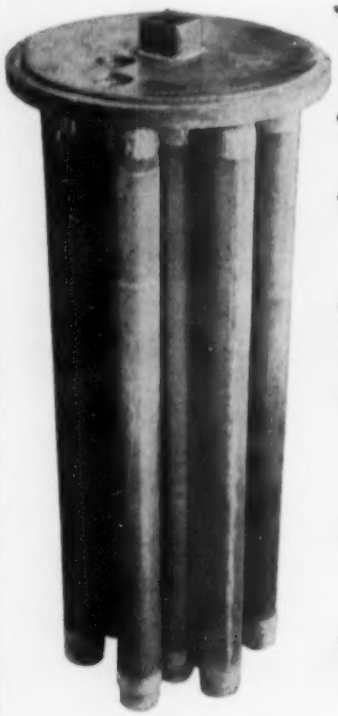

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the same length of day for a 7-day week laid 129 more joints per week but 21 fewer per working day. Canadian weekly average output was 1,804 joints (75,768 ft.) or 257 joints per working day.

The record output for the whole project was set by the Alaskan spread in one 12-hour day when it completely welded 542 joints for 27,764 ft. (5.2 miles). At this rate a joint was added by the pipe gang on an average of one in 1.32 minutes. The Canadian spread's best record for a 12-hour day was 420 joints for 3.3 miles of line, averaging a joint in 1.73 minutes.

Welding methods were the same as in the United States. However, a hot pass was run immediately behind the stringer bead similar to the common practice for larger-diameter pipe.

The stringer bead was run with 5/32-in. No. 5 Fleetweld rod. For the hot pass 5/32-in. No. 85 shielded arc rod was used. The weld was completed with 3/16-in. No. 5 Fleetweld.

Preheating was only done on the few days when temperatures were down to 15° to 20° F. above zero.

Radiographic inspection was applied to about 20 per cent of the welds of the project.

The soundness of the welding program was demonstrated by hydraulic tests on the entire line. There were no leaks in any of the field welds.

Hydraulic testing . . . For pressure tests, 200 miles of water was pumped through the line. This was followed by a batch of diesel oil which, in turn, was followed by jet fuel.

Testing was done at a minimum pressure of 1,500 psi. on the Alaskan portion and 1,900 psi. on the Canadian. Pressures were calculated at the low point indicated by the profile of the section of the line being tested. After pressure was dropped to the amount required, the line was walked to look for evidence of defects.

There were four ruptures in the pipe on the Canadian section. In the Alaskan section there were a few damaged places that could be traced to injury from tractors running over the ditch after construction. The identity of the equipment causing the damage could not be determined because tractors are commonly used for numerous operations regularly carried on in Alaska, particularly in wooded areas.

Revamped ditcher . . . A reinforced 12-ft.-diameter wheel was substituted for the 18-ft. wheel of the standard ditching machine. The 14 buckets with reduced spacing on this 12-ft. wheel made it possible to have a continuous digging cycle. Jarring action was thereby eliminated.

At the height of the construction season, ditching was done on a 24-hour basis with two 12-hour shift crews working 6 days a week. During the Sunday shutdown, maintenance work was done.

In clearing right-of-way in small-brush country, a 6-ft.-diameter ball was dragged by two tractors.

Terrain . . . The ground was gravelly and sandy varying from conditions where there was little or no frost to areas where there was muskeg and tundra underlaid by permafrost soils. In a good many places, permafrost started immediately under the grass roots. When the insulating blanket of vegetation was disturbed, the underlying frozen soil thawed so that the right-of-way became a quagmire and equipment wallowed down to the ice underneath. At isolated spots there was some solid rock.

The rolling terrain was generally typical of foothills in rugged mountain range country.

From the heavily timbered mountainous country north of Haines, the pipeline goes up to the maximum elevation of the project, 3,750 ft. After leaving the heavy timber, the woods were of Arctic scrub fir. Muskeg and tundra covering permafrost were usually found at flats between the hills. Occasionally there was permafrost on hill tops.

Kluane Lake problem . . . In the original planning, consideration was given to either crossing 7 miles of water at Kluane Lake, which is 290 ft. deep, or skirting the lake with 8 additional miles of pipe. The longer land route was adopted as more economical.

Station operation . . . For the near future it will be necessary to operate the pump stations only 12 days per month. While the normal capacity of 12,000 bbl. per day exceeds present needs, it is advantageous for emergency conditions and possible increased demand later on.

Pump-station equipment . . . There are five pump stations on the system. Three of these are to be used for normal operations.

Station 1 at Lutak Inlet, near Haines, Alaska, has three quintuplex pumps in parallel, each rated at 4,132 bbl. per day maximum. Maximum discharge pressure is 1,200 psi. They are driven by 285-hp. six-cylinder diesel engines.

Station 2 is 48 miles west of Haines at 1,300-ft. elevation. It has three four-stage centrifugal pumps in series driven by diesel engines of the same type as those at Station 1.

Station 2-A is 10 miles northwest of Haines Junction which is 143 miles from the port of Haines. Two four-stage centrifugal pumps are driven by 450-hp., eight-cylinder diesel engines.

Station 2-B is 194 miles beyond Station 2-A at 2,673-ft. elevation. It has the same equipment as Station 2-A.

Station 3 is 7 miles west of Tok Junction at 1,591-ft. elevation. There are five quintuplex pumps here. Three of them are like those at Station 1. Two of the pumps are triplex, each rated at 1,526-bbl. per day. All five pumps are driven by diesel engines.

Atomic Data to Be Released

WASHINGTON.—Thousands of reports on the industrial use of atomic energy will be made public over the next few months by the Atomic Energy Commission.

Many of these reports may be of value to the oil and gas industry, which already has made extensive use of radioisotopes and is now studying other types of atomic materials.

The reports will be distributed at the cost of reproduction through the Commerce Department's office of technical services.

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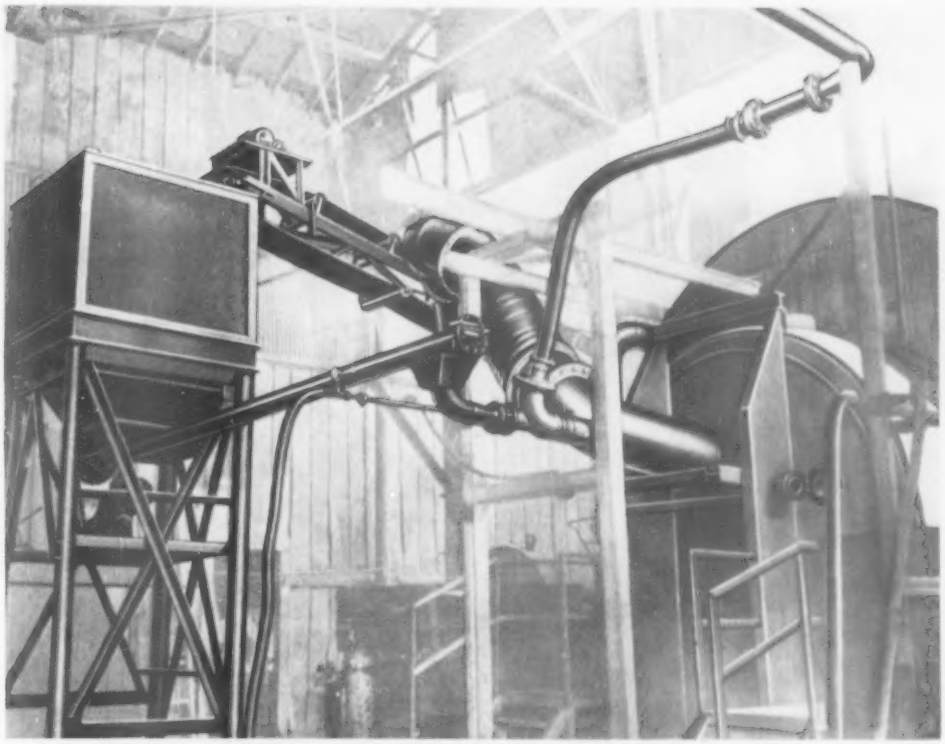

BURNING FLUID COKE—Existing oil-burner housing was adapted to handle coke in a high-velocity air stream. Coke goes from hopper bottom to screw conveyor and then is aspirated through special burner into kiln.

Fluidized Coke Tested in Rotary Kiln

Full-scale tests demonstrate that this fuel will burn with satisfactory results

by R. M. Conforth and E. R. Lee, Jr.

BASED on tests conducted by Kaiser Engineers, fluid coke should have wide application as industrial fuel. It has been successfully burned in a rotary kiln, and is equally adaptable for use in oil heaters and boiler installations.

Kiln tests . . . Full-scale combustion tests were conducted on rotary-kiln operations at the Permanente, Calif., plant of Permanente Cement Co.

A 50-ton sample of fluid coke was obtained in March of this year for test purposes from Carter Oil Co.'s new fluid coking unit at Billings, Mont. This coke was shipped from Billings to Permanente in a closed railroad hopper car of the type used to transport bulk cement. The car was spotted and unloaded over a conventional track hopper. An open dump truck was used to transfer the material to the test site.

Authors are with Kaiser Engineers, a division of Henry J. Kaiser Co., Oakland, Calif.

The analysis of this sample as received is as follows:

SCREEN ANALYSIS

Screen size	Cumulative per cent retained
8	5.2
35	11.1
65	48.6
100	80.1
200	95.8

COMPOSITION

	Weight per cent
Carbon	89.1
Sulfur	6.0
Volatile (1,742° F.)	3.8
Ash	0.16
Vanadium	0.03
Nickel	0.01
Net heating value, B.t.u. per lb.	14,300

Kiln operation . . . At Permanente, there are five rotating kilns which are among the largest in the cement industry. These kilns are 450 ft. long, 12 ft. in diameter, and are inclined at ½ in. per foot. The average speed of rotation is 57 r.p.h., with an average clinker capacity of 4,000 bbl. per day each.

These kilns are normally fired with natural gas purchased from the local utility at an average of 948,000 cu. ft. per hour. During one or two extremely cold months each year, Bunker C fuel oil is used. Fuel is admitted to the kiln by a burner which extends 8 ft. into the discharge end of the kiln.

The burning zone begins approximately 15 ft. from the hood and is about 50 ft. long. Primary air for combustion is provided by 75-hp. fans. It is in the combustion zone where the temperature reaches 2,900° F. that the majority of kiln reactions occur. The

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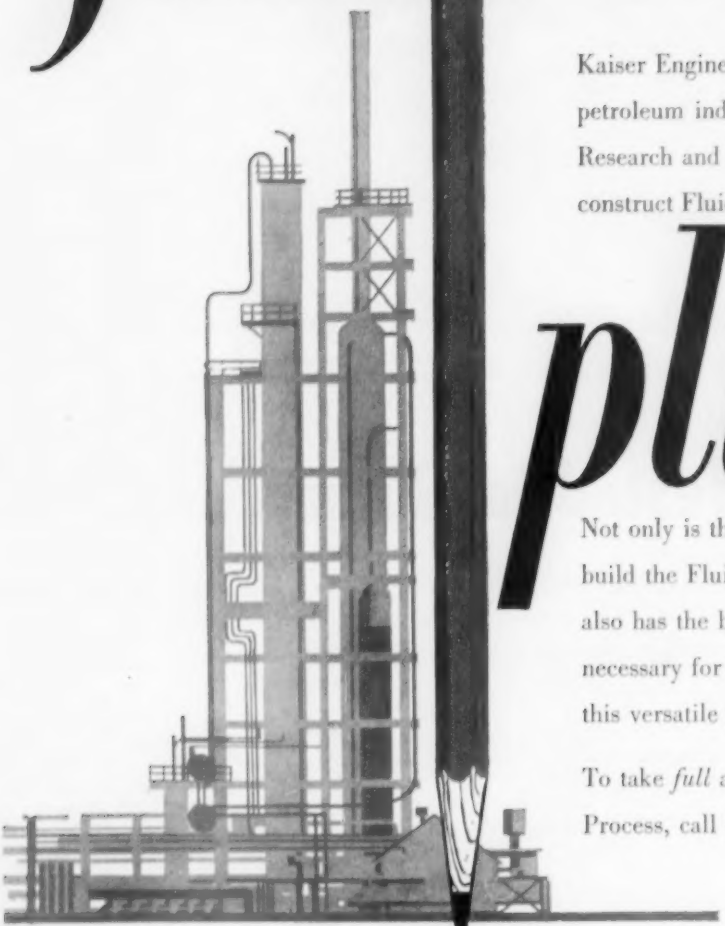

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back-end or feed-end temperature of the kiln is approximately 700° F.

Test operations . . . Of the five kilns at Permanente, No. 1 kiln was selected for the fluid coke testing primarily due to its ease of access and adjacent space for setting up test equipment. Surplus material and equipment around the plant was used wherever possible.

Because of the high plant-production schedule, it was not possible to shut down the kiln either to make modifications in the burner arrangement or to assist in the actual tests. This requirement made mandatory the use of existing 4-in. diameter oil-burner housing and adapting it to handling coke in a high-velocity air stream.

The fluid coke was transferred from the open dump truck to a 7-ton elevated bin adjacent to the kiln by means of a bucket elevator. To this bin was fitted a hopper bottom that connected directly to a 6-in. screw conveyor pipe. The conveyor screw was driven by a varidrive unit with a speed range of 4 to 1.

Coke discharging from this conveyor was aspirated by compressed air through the special burner into the kiln. A maximum of 6¾ tons of coke per hour could be handled with this arrangement through the 4-in. burner port.

Preliminary runs were made on March 17, 18, and 22, 1955, burning the raw fluid coke as received without screening or grinding. The maximum firing used during these tests was about 3½ tons per hour delivered to the kiln with natural gas furnishing the remainder of a necessary heat input.

During these runs, each of which was about 2 hours' duration, a dropout of large particles of unburned coke was observed which were later found in the analyzed test clinker.

Ground coke . . . These preliminary tests suggested the potentialities of fluid coke as a fuel. Because of the dropout of the larger particles, some of which were approximately ⅜ in. in diameter, it was decided that the coke should be ground to a more uniform size for subsequent testing. Accordingly, about 10 tons of the coke was ground, having the following screen analysis:

SCREEN ANALYSIS

Screen size	Cumulative per cent retained
16	0
50	1.0
65	11.0
80	20.1
100	50.3
200	75.5
Weight of ground material:	
Tamped, lb. per cu. ft.	63.4
Loose, lb. per cu. ft.	55.7

"Preliminary tests suggested the potentialities of fluid coke as a fuel . . . A preliminary run with ground coke . . . indicated a performance almost identical with 100 per cent gas flame."

The methods developed by Kaiser Engineers lead us to believe that on a commercial basis this grinding can be done for less than 30 cents per ton.

A preliminary run with the ground coke was made on May 5, 1955. With the input of primary air for coke combustion at 600 cu. ft. per minute and 80 psi., and with 50 per cent natural gas as the auxiliary fuel, the color, shape of the flame, lack of fallout, and ignition 10 ft. beyond the nozzle indicated a performance almost identical with 100 per cent gas flame.

This was followed on May 18 with a commercial-scale demonstration under similar conditions which was witnessed by representatives of oil companies and other large industrial firms. The limited supply of ground coke available permitted only a brief demonstration. The 14,400 lb. of coke in the hopper was consumed in 1.2 hours. The maximum firing rate of 13,500 lb. per hour was attained after a rapid buildup of coke flow during which time the gas was reduced accordingly.

Auxiliary firing of gas in reduced quantities was necessary to maintain input heat balance, but for several intervals of short duration the gas was turned off permitting the kiln to operate entirely on coke. The normal natural gas fuel consumption of this kiln is approximately 212 M.c.f. per hour with 1,100 B.t.u. per s.c.f. gas or 233,200,000 B.t.u. per hour. Since the heating value of coke is 14,300 B.t.u. per pound, about 17 per cent of the normal gas flow was required to maintain the kiln temperature.

Sampling devices and other test equipment were set up well in advance of this demonstration in order to obtain the maximum amount of information during the test. Other than the temperature checks within the kiln itself, the sampling and testing were accomplished at both ends of the kiln; of the clinkers for any significant change in composition, and of the effluent gases for any significant change of analysis, particularly with respect to sulfur.

Test results . . . During the test the kiln temperatures rose from approximately 2,680° F. to about 2,800° F. and the back end or gas-outlet end of the kiln rose from 680° F. to 705° F. The uptake draft was kept constant at 2 in. of water.

Samples of clinker were taken during the run which were analyzed as follows:

	Control (per cent)	Test (per cent)
SO_3	0.027	0.034
Free CaO	0.120	0.060
Ignition loss	0.090	0.000

The laboratory advised that these clinker samples appeared normal and analyzed as such.

The bulk of the sampling and testing was conducted at the back end of the kiln, directed toward analyzing the kiln effluent with particular reference to the sulfur content and its accompanying dangers of air pollution. An isokinetic probe, similar to a pitot tube, was used to take centerline gas and dust samples.

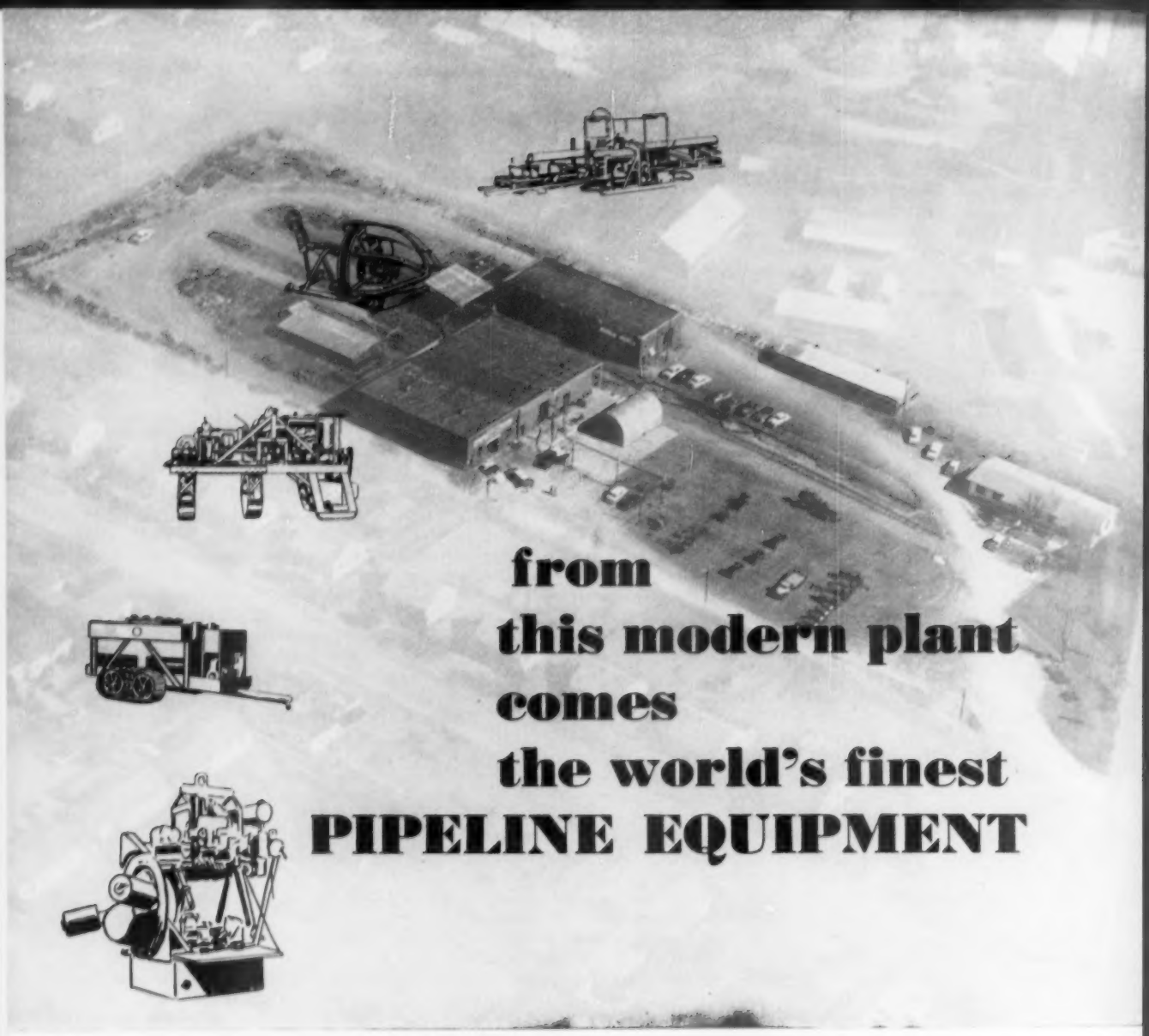
The gas samples were analyzed by a Mine Safety Appliance Co. H_2S detector, essentially a glass tube with a reagent coating of silver cyanide on aluminum oxide granules. The concentration of H_2S determined by four tests of the M.S.A. detector showed 0.0003 per cent by volume on a dry-gas basis.

A paper thimble was used to collect effluent dust. Sulfur compounds in the dust are in the form of both sulfate (calcium sulfate) at 16 per cent and sulfite (sodium potassium sulfite) at 84 per cent. Based on a rate of flow of 34.4 tons per day and corrected for the control run, the analysis ran 0.97 per cent sulfur and was equivalent to 27.4 lb. per hour of sulfur.

Sulfur compounds . . . The total sulfur in the gas (H_2S and SO_2) collected in a Na_2CO_3 solution and condenser water computed at 185,000 cu. ft. per minute at 480° F. and corrected for the control run was determined to be 33.2 lb. per hour. It was concluded from the test that the SO_2 in the gases of combustion reacts with the alkaline in the slurry feed, resulting in the appearance of sulfur compounds both in the clinker and the dust particles collected by the precipitators.

From the test data and observations, it would appear that if all five kilns of this plant were operating wholly on fluid coke, the total sulfur released to the atmosphere would probably be on the safe side, or not objectionable, assuming there is a 50-50 split of the sulfur being found in the stack gases and in the dust collected by the precipitators.

The amount of sulfur found in the clinker was insignificant. Any reduction of the total coke burned or a reduction of sulfur below the 6 per cent analysis of this sample would minimize the air pollution problem.



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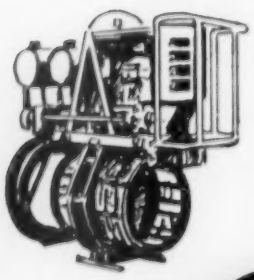

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ELECTRIC LOGGING—64

Comparing Different Logs of Hard Formations

by R. I. Martin

FIG. 1 shows a comparison of most of the logs used for limestone evaluation, together with porosity and permeability from cores. In order from left to right, they are: (1) gamma-ray logs from three different surveys; (2) neutron logs from two different surveys; (3) core permeabilities from a maximum of 100 md. to a minimum of 0.1 md.; (4) core porosities from 16 to 0 per cent; (5) MicroLog on a scale of 0-5 ohm-m; (6) Laterolog on a scale of 0-20 and 0-200 ohm-m; (7) the 10-in. normal scale of 0-15 ohm-m

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy, Rolla.

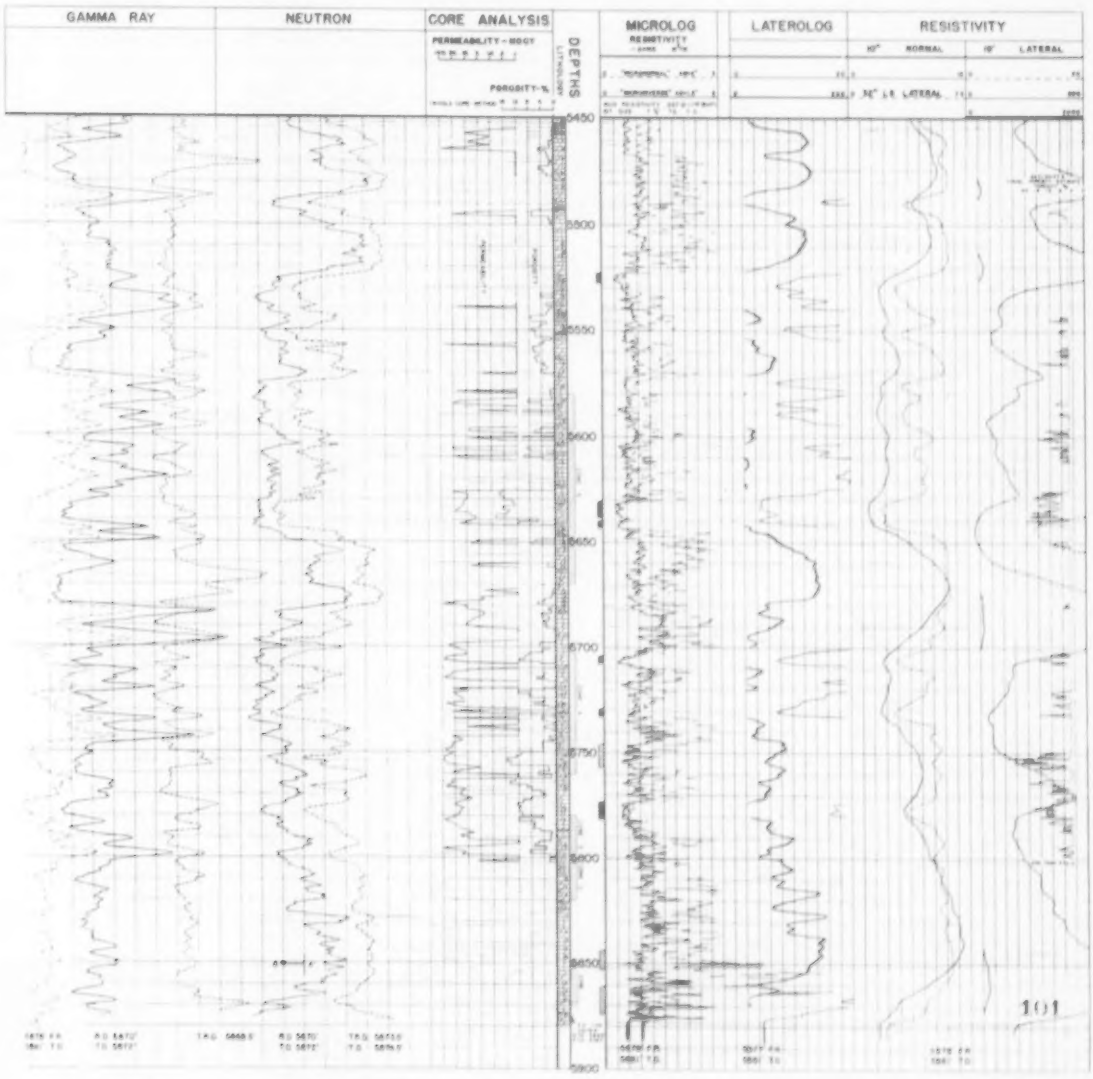


Fig. 1—Comparative results of radioactive and electric logs of various types run on the same limestone formation.

and 32-in. limestone device on a scale of 7.5 ohm-m; (8) the 19-ft. lateral on a scale of 0-200 and 0-2,000 ohm-m; and (9) geologists' visual estimate of porosity from 6 to 24 per cent.

Porosities of less than 6 per cent are not differentiated, and are shown by the broken vertical line. Mud resistivity is very low—0.037 ohm-m at the depths considered.

Test 1 was made through perforations from 5,850 to 5,870 ft. which cover parts of two intervals indicated by logging examination as being possibly permeable. Microresistivities are high, however, so that the evidence is not very good. None of the other logs suggest that the zone is attractive. Core data are not plotted through this section. The core descriptions do not suggest that there is very much porosity or permeability. This interval was acidized with 500 gal. of acid, and the well was swabbed dry.

Test 2 covers the interval 5,800-5,820 ft., which appears even less attractive on the MicroLog. Again, other evidence does not lead to the conclusion that the zone is productive. An acid treatment was attempted but the formation would not take any acid.

Additional perforations were shot for Test 3 from 5,780 to 5,800 ft., and again the formation would not take acid. The first good MicroLog indication of permeability occurs at the top of this interval. There is an overlap of 2 ft., but with possible depth discrepancies it is probable that this permeable zone was not opened. This MicroLog feature is supported by all the other information except in the case of the third gamma-ray log.

Test 4 was made from 5,700 to 5,760 ft. After an acid treatment of 500 gal., the well flowed 169 bbl. of oil in 5 hours. These perforations cover intervals which appear attractive on all the logs.

Test 5 from 5,580 to 5,670 ft. brackets the most attractive zone in that part of the well and gave similar production to that obtained from Test 4. The well was completed to produce from both 4 and 5 with a potential of nearly 1,300 bbl. of oil per day.

It should be noted that the geologist's estimates of porosity show reasonable agreement with core determinations. Permeability determinations appear to be high in general and show less variation than might be expected. It is not known what control is used in selecting samples for analysis, but the lack of agreement between cores and MicroLog is striking. Production Test 3 suggests that the MicroLog is a more reliable guide to the general lithology.

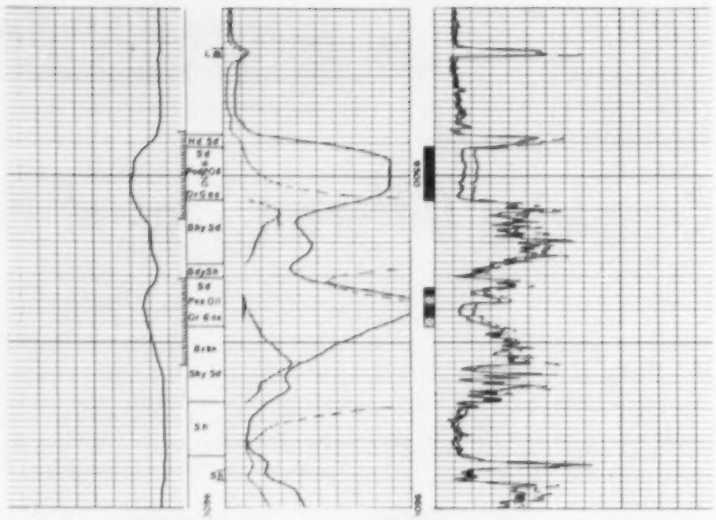


FIG. 2—The MicroLog distinguishes permeable sections from impermeable sections. Note the more definite indication of these sections by this technique than by the S.P. curve.

Fig. 2 shows an example of the MicroLog response to cemented sands. The upper sand is tight in the upper part, as may be seen from the fact that the increase in S.P. lags behind the increase in resistivity. The MicroLog confirms that this upper part is impermeable.

The S.P. curve does not show a sharp feature at the base of the upper sand, and opinions will vary as to where the lower contact should be recognized. Reference to the MicroLog shows that permeability stops fairly high in the sand. It is higher than could be inferred from any of the curves on the electric log.

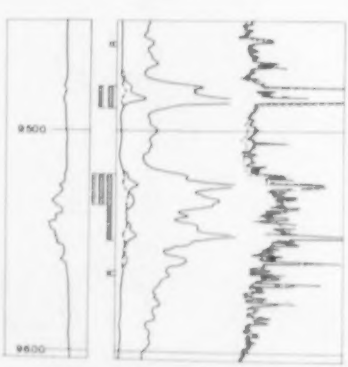


Fig. 3—Production from perforations shown was small amount of gas, condensates, and salt water.

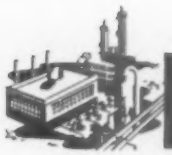
In a similar manner, the S.P. curve does not define the lower sand at all sharply. The MicroLog, however, shows that permeability is quite restricted.

The triangular shapes of the normal and lateral resistivity curves opposite the lower sand should be noted. These are due to the thickness of resistive beds, which is great enough to contain all three electrodes.

Fig. 3 shows a case where a production test was made which confirms the negative indication given by the MicroLog. Squeeze-cement jobs were carried out through perforations 1 and 2. Perforation 3 gave 2,000 M.c.f. of gas, 48 bbl. of condensate, and 57 bbl. of salt water per day. Both sets of perforations were squeezed off and the interval from 9,480 to 9,490 ft. opened again. A test with a drill-stem tester failed to yield production. Both the MicroLog and S.P. curve suggest a lack of permeability which is confirmed by this production test.

Interval 5 from 9,520 to 9,534 ft. was reperforated and made some salt water. It was squeezed and perforated again, and the well produced 570 M.c.f. of gas, 13 bbl. of condensate, and 9 bbl. of salt water per day through a smaller choke.

The source of the water may be from the lower part of the producing sand. In this case it is impossible to make a definite statement because the low, long-normal resistivity may be due to the thinness of the lower individual sand layer.



JOB IMPROVEMENT FOR THE PROCESS FOREMAN—21

Helpful Facts About Positive Displacement Pumps

IN a simplex pump (one steam cylinder and one liquid cylinder), the main steam slide valve is often operated by an auxiliary steam piston. This piston is controlled by an auxiliary steam valve. This means that steam pressure itself is used to move the main slide valve, which gives quicker and more positive valve action. In a duplex pump, two steam valves are used, one for each steam cylinder. Each steam valve is operated from the connecting rod on the opposite side of the pump.

Thus on a duplex pump, the valve motion is such that one side finishes its stroke and waits for its valve to be moved by the other side of the pump before it can start on its return stroke. This alternate pumping action of the two cylinders produces a smooth, continuous discharge flow.

Q. What's the function of liquid-end valves?

A. Just as steam valves control the admission of steam to the power cylinder of a pump, valves must be provided to admit liquid to the fluid cylinder and to permit the liquid to be discharged from the fluid cylinder. However, operation of the liquid-end valves is much simpler than the steam valves. This is because liquid-end valves' only function is to admit or discharge liquid from the fluid cylinder, whereas the steam valves must be set to properly time the stroke of the pump.

The type of valves most generally used for this purpose are flat-plate, spring-loaded check valves which permit flow in one direction only, the suction valves being arranged to permit flow only into the cylinder and the discharge valves to permit flow only out of the cylinder.

The usual method of arrangement of these valves is to place them in two decks above the liquid cylinders with the discharge valves located over the suction valves.

Courtesy of Phillips Petroleum Co. refinery department.

For high-pressure or high-temperature service, many other types of valve arrangements are used. However, figure in the previous installment shows the most common type employed for general service pumps.

Q. How are sizes of steam pumps designated?

A. The size of a steam reciprocating pump is generally designated by a three-digit number such as 646, which would designate a widely used size of low-pressure pump. The first digit, 6 in this case, is the inside diameter of the steam cylinder measured in inches. And the last, 6, represents the stroke of the pump also in inches.

In a direct-acting pump, the discharge pressure is a function of the ratio of areas of the steam and liquid piston heads. For any given steam pressure, the total force exerted by the steam piston is simply the area of the head of the piston times the steam pressure. Therefore, since the steam and liquid piston are directly connected, the liquid pressure is equal to this total force divided by the area of the liquid piston.

In a pump where the steam cylinder is larger than the liquid cylinder, the liquid discharge pressure will necessarily be higher than the steam pressure. For example, if the area of the steam piston head is 10 sq. in. and 200 psi. steam is being used, the total force transmitted into the connecting rod will be (10 × 200 =) 2,000 lb. This force will be transmitted on to the liquid piston. If this liquid piston head has an area of 5 sq. in., a pressure of (2,000 ÷ 5 =) 400 psi. could be imposed upon the liquid.

Q. How do you estimate the capacity of a reciprocating pump?

A. First find the diameter and length of the cylinder. Then multiply the volume in cubic inches of the cylinder by the number of piston strokes per minute. Finally, divide that total by 231 and you'll have the gallons per minute at flowing temperature at 100 per cent efficiency.

The efficiency on reciprocating pumps is normally figured at 85 per cent. This will vary considerably as to the liquid being pumped and condition of valves or rings in the pump.

Q. What should you watch in starting reciprocating pumps?

A. Quite a few things. To summarize them, here's a check list of starting rules:

1. Check all flanges, piping, heads and glands to be sure they are tight and ready to receive the material to be pumped.

2. Open bleeders on power and liquid ends of pump and drain any water or other materials.

3. If pump is steam powered, open steam pump slightly and allow the steam to blow through the bleeders until pump is warmed and condensate is blown out.

4. If water or oil cooling or lubrication is provided be sure they are in service.

5. Open suction valve slightly, with discharge closed and allow the material to be pumped to displace the air in the cylinder through a bleeder valve on the discharge.

6. After pump is full of liquid, close all bleeders on liquid end and open discharge and suction valves.

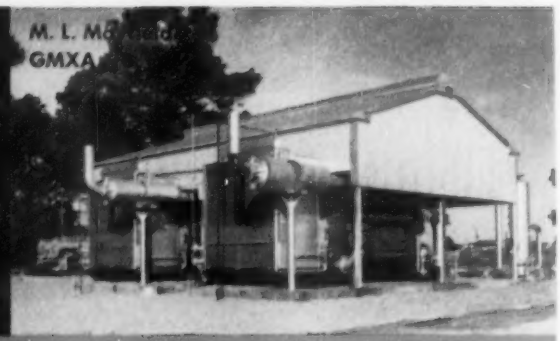
7. Be sure lineup to vessel or tank to which you are to pump is completed and all valves are open.

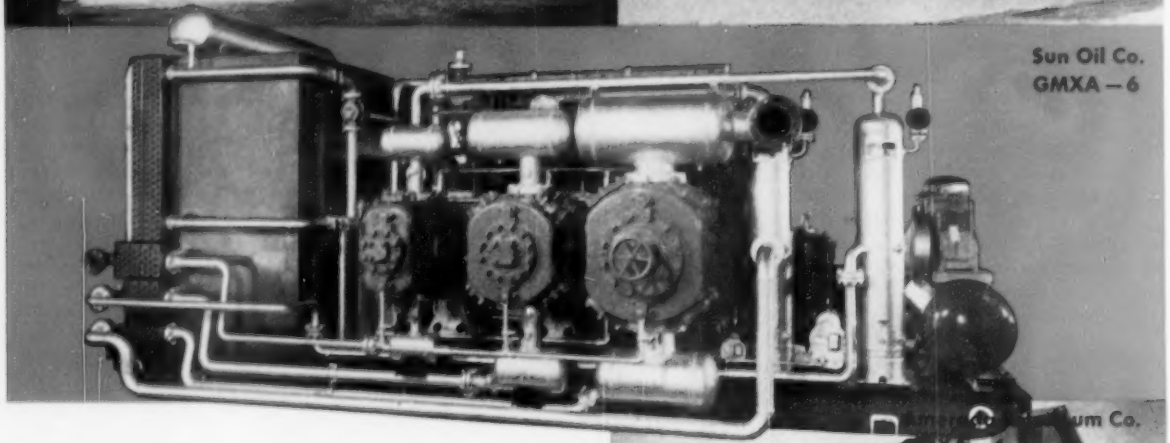
8. Check and be sure any block valve on the exhaust steam line from pump is open.

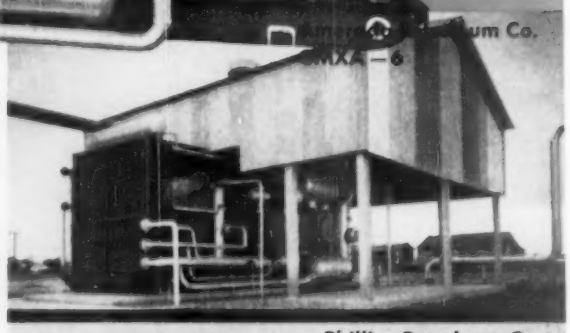
9. Close bleeders on steam end and open steam enough to start pump slowly.

10. Keep close check on the gage provided on the discharge and be sure the liquid is being allowed to leave the pump discharge.

11. If pressure is normal and all equipment is operating in a satisfactory manner, the pump may be speeded up by hand or put on control.







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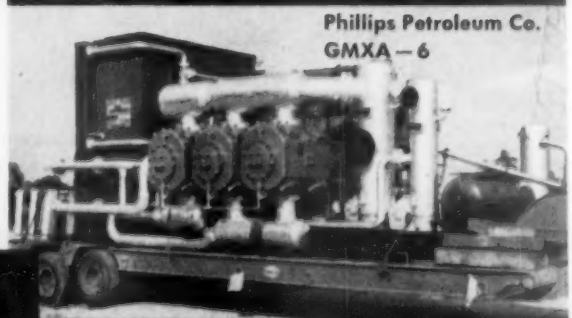

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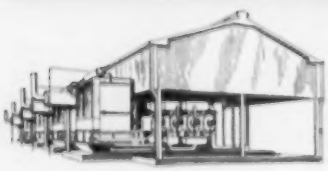

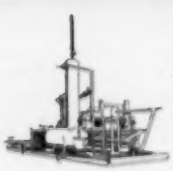

UNDERGROUND STORAGE—4

Where U. S. Salt Deposits Are Located

by N. E. van Fossan

BRINE disposal, washing procedures, and formation of salt deposits were covered in preceding installments of this series. Here general characteristics of U.S. salt deposits are briefly given.

1. Permian Basin

Permian beds (Fig. 3) are evaporative. They show the major characteristics of such depositions—that is, banded salt sections intermingled with major stringer systems. They are mostly anhydrite, but, in the northern reaches, they include some major red bed section and intermingled shales.

Author is with Texas Natural Gasoline Corp., Tulsa. Paper presented at N.G.A.A. Dallas meeting, 1955.

The entire bed is variable in thickness and configuration. The salt-bed thickness ranges from 0 to 1,500 ft. The major portion is capped with a strata of massive anhydrite, commonly known as the Rustler anhydrite.

Drilling techniques . . . Methods used to drill in the Permian basin are very straightforward. Conductor pipe is generally set to below the fresh-water sands at about 350 ft. A second string is set inside the Rustler anhydrite and very near the top of the salt. The salt section is penetrated from 900 to 1,000 ft., depending on the particular area in quesion.

A careful operator will core the entire section to be utilized for underground storage, and give careful study to the cores thus taken. In this way, he can make sure that all insoluble stringers and stringers of nonevaporative nature will be detected and plotted. Using this information, a logical washing program may be devised so that a storage cavity with the greatest possible structural strength, and with the least possibility of minor stringer collapse, will be developed.

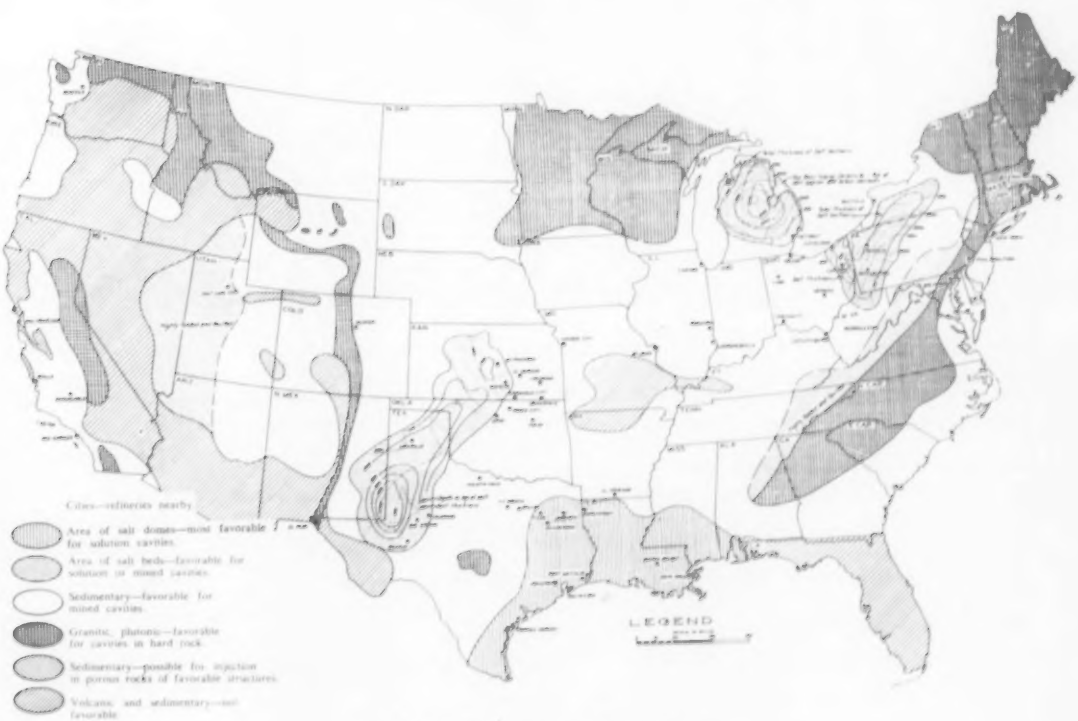
Cities—refineries nearby
Area of salt domes—most favorable for solution cavities.
Area of salt beds—favorable for solution in mined cavities.
Sedimentary—favorable for mined cavities.
Granitic, plutonic—favorable for cavities in hard rock.
Sedimentary—possible for injection in porous rocks of favorable structures.
Volcanic and sedimentary—not favorable.
LEGEND

Fig. 3—Areas classified for subsurface storage.

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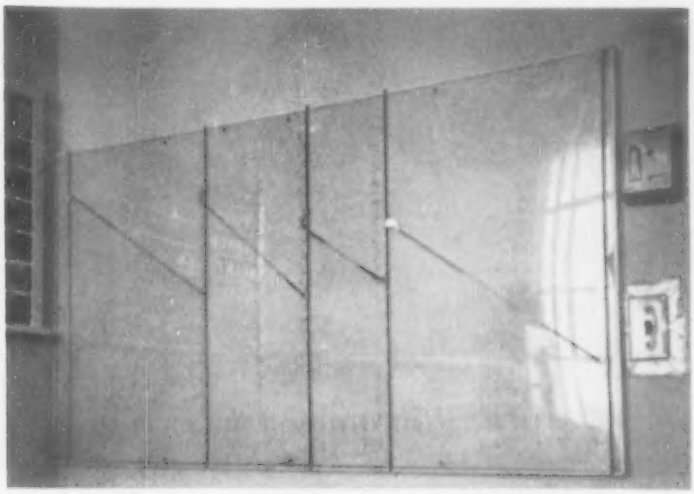
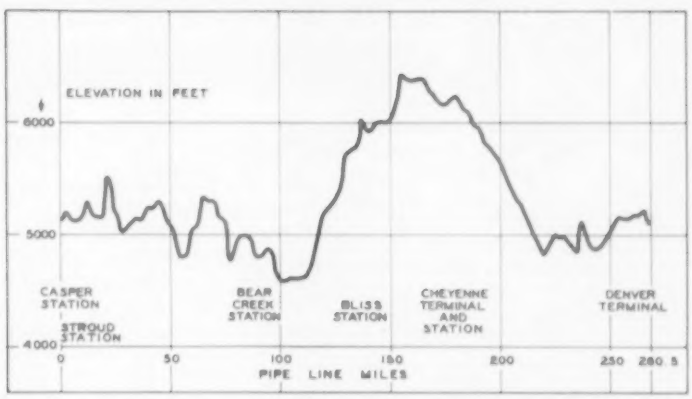
TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS



Pressure-plotting board helps



dispatcher make profile changes

AN accurate knowledge of the pressure profile on an operating line is very necessary for efficient operation. In a products line in mountainous country, for example, a minimum pressure must be carried at receiving stations to prevent vaporizing of products at high points in the line.

For that reason, E. H. Baird, chief dispatcher of Wyco Pipe Line Co., devised the convenient pressure plotting board shown in photograph.

The large board has an elevation profile of the entire line similar to that illustrated. Mounted in front of the profile are vertical rods at each station and drawoff location. These form guides for small slides to which are fastened light springs. The springs, stretched from discharge pressure of one station to receiving pressure at the next, give a close approximation to pressure along the section.

Most attractive feature of the board is the ease of making pressure profile changes as pump units along the line come on or go off. For instance, if throughput calls for addition of a unit at the Cheyenne station, the dispatcher places the Cheyenne discharge spring at the reported discharge pressure. Then he places the slide corresponding to Denver's receiving pressure at a point where the spring is always above the elevation profile.

When the reading of the proper pressure for Denver is taken off the pressure scale on the board, the backpressure valve at Denver is set to keep that amount of pressure. Thus, nowhere along the line is there danger of breaking the stream.

A line pressure gage is in the dispatcher's office along with air controls for remote setting of the backpressure valve.

A scale on the board shows pressure in pounds per square inch and corresponding feet of fluid for gasoline, kerosine, and fuel oil.

Bosun's chair gets air

TANK painters working on storage tanks of the Alaskan Pipeline System are using this type of rolling, air-powered stand. It's a takeoff from a conventional bosun's chair, having an air-driven winch mounted underneath to raise and lower. Rollers mounted on stubs keep it the right distance away from the tank.

Pressure-sensing devices control pressure and flow

SEMIAUTOMATIC control of pipeline pressure and flow by means of electrical pressure-sensing devices is a feature the new 256-mile, 16-in. pipeline of Minnesota Pipe Line Co. The

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"Reversible," "Standard" and "Ideal" types in all sizes. Jaws are drop forged from special steel, are carefully milled, heat treated, hardened and tested. The Handles are forged spring steel. The Chains are proof-tested to ⅔ catalog strength (1,200 lb. to 40,000 lb.). "Reversible" Jaws give double jaw life. "Standard" Jaws have extra bearing on the handle and forged-in chain guides. The "Ideal" Tongs have V shaped teeth for a sure grip on irregular shapes, fittings, etc.

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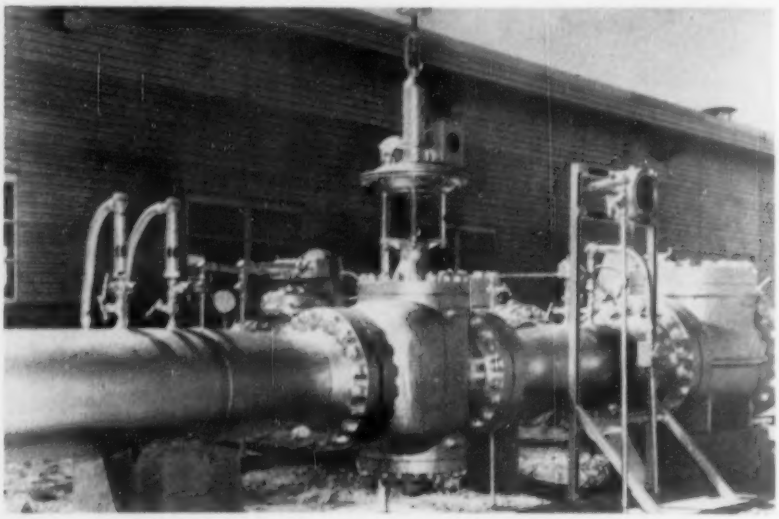
PIPELINE PATROL



Two pressure-sensitive cells are on each side of station control valve. One set controls valve, the other connects to indicators within building.

line connects Great Northern Oil Co.'s new 25,000-bbl. per day refinery at Pine Bend, Minn., with a delivery point on Lakehead Pipe Line Co. at Clearbrook, Minn. One of the line's stations is at Clearbrook and the other is near Little Falls, Minn.

Five Baldwin SR-4 pressure cells, operating on the principle of the bonded-resistance wire strain gage, are used at each station to measure station suction and discharge pressures. Two of the pressure cells, one on suction and one on the discharge line beyond an automatic-pressure-control valve, are electrically connected with a recorder-controller which controls this valve pneumatically.

In each station three pressure cells are electrically connected into pressure indicators on an instrument panel. These indicators are volt meters calibrated to read directly in psi. They are operated by electronic amplifiers which convert the extremely small variations in the cell output into power enough to operate the meters.

These indicators show two discharge pressures (one on each side of the automatically controlled valve) and the station suction pressure.

At the Clearbrook station the suction pressure cell and indicator have a capacity of 100 psi. while at the booster station at Little Falls, the suction pressure capacity of the cell and indicator is 600 psi. Discharge pressure cells at both stations have capacities of 1,500 psi. on the station side of the control valve and 1,200 psi. on the discharge line.

Conveyor for kettle loading

A SHOP-MADE, truck-mounted conveyor system is saving time for Houston Contracting Co. in loading of dope kettles. It's used principally on lines being coated with asphalt. The small-size packages of asphalt coating (120 lb.) lend themselves readily to handling in this manner.

The truck picks up enough packaged coating from a central coating stockpile for a kettle charge. Then the truck and loading crew go directly onto the right-of-way where the coating material is broken up and loaded into a spare kettle. This saves hauling a dope kettle back and forth to a central loading point. Also, manpower required for loading is reduced.

The conveyor is driven by a small, integrally mounted air-cooled engine. For highway travel the conveyor swings around in line with the truck bed. The unit was made in the contractor's shop.

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1539 Lyons St., Evanston, Illinois

PIPELINE PATROL

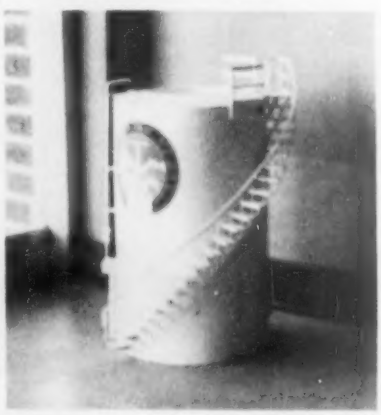
New use for floor wax

JUST spread it on—no rubbing necessary." That's the claim of a well-known wax manufacturer for its liquid floor wax. Whether the wax company knows it or not, its product is also being used on a pipeline right-of-way.

On the Colorado Interstate 22-in. line from Laramie, Wyo., to Denver, Houston Contracting Co. was having trouble bending pipe without scarring the outside surface. Grease and graphite were both tried on the bending shoes but to no avail. Then someone came up with the idea of using floor wax. The liquid kind proved just the thing. Now, before making each bend, the machine operator paints the bending shoes with a light coat. Each joint comes through without a mark.

Colorado Interstate is using a very-high-strength pipe for this new line and this was one reason for the bending troubles.

"Atmospheric" storage tank



FOR atmosphere, Wyco Pipe Line Co. has this miniature storage tank as an ash receptacle in their main office reception room at Denver. It's a faithful replica of some of Wyco's small storage tanks—complete down to the tank gage and thief hatch.

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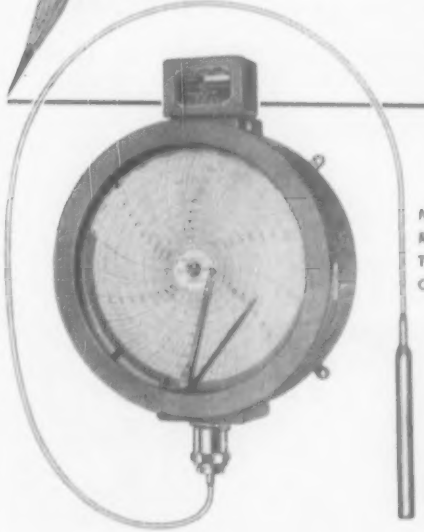

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GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

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Insist on the genuine — look for the *Blue and Black Label* with the name "GOTKOOL" in Red.

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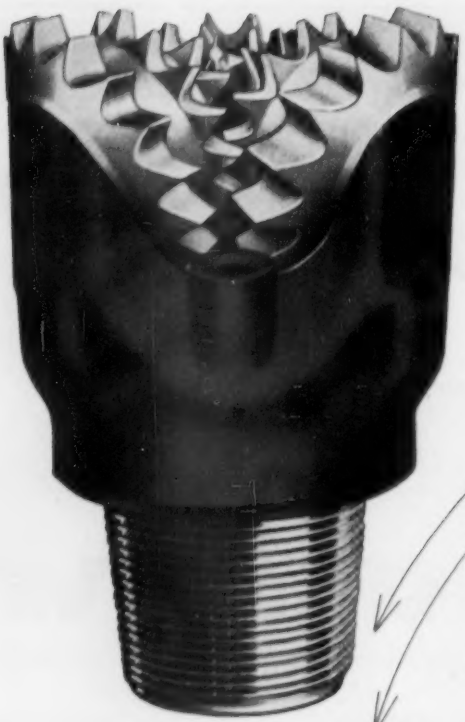

Between 3-Cutter and 4-Cutter Bits there should be only one question

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Drilling Contractors

Moore Quits Trident to Form New Canadian Firm

Moore Drilling Co., Ltd., is a newly formed contract drilling company operating in western Canada. Headquarters are at Calgary, Alta., with offices in the Petroleum Building. Heading the company is E. E. Moore, formerly vice president and manager of Trident Drilling Co., Ltd., also of Calgary. Prior to his association with Trident, of which company he was one of the organizers several years ago, Moore was in charge of Arrow Drilling Co.'s operations in western Canada.

E. E. MOORE

The new company is starting with three rotary rigs, two of which are in the Alberta area, while one is working in Manitoba. Rigs include a Brewster N-4, an Emsco 450, and a Unit 40.

Richardson & Stewart Drilling Co., San Antonio, is moving a heavy rig to Anse La Butte, in St. Martin Parish, Coastal Louisiana, where it will drill a 10,000-ft. test for Stanolind Oil & Gas Co. The new test is at 1-Broussard, in 73-9s-5e, on the east flank of the Anse La Butte dome, where active development is under way in newly discovered deep sands.

Maxwell-Herring Drilling Co. is contractor on a 6,000-ft. wildcat test Hunt Graham is putting down 2 miles west of Frankston, in Anderson County, East Texas. Location is at 1 Henderson estate, in the Alfred Benge Survey.

C. B. Webster Drilling Co., Houston, is to drill a 16,000-ft. wildcat test in the Patterson area, St. Mary Parish, Louisiana Gulf Coast. It is a contract operation for Southern Natural Gas Co. with location in 42-15s-11e.

Clegg & Hunt, Houston, will drill a projected 15,000-ft. test 3 miles west of Morse, in Acadia Parish, South Louisiana. It is a contract job for Houston Oil Co. at 1 Wright, in 66-10s-2w. Location is 2 miles south of the west end of Midland gas area.

Como Drilling Co., Natchez, Miss., is a joint operator with Vasser & Brown, Inc., also of Natchez, on a 6,500-ft. test it will drill at a wildcat location 2 miles southwest of Saline Lake field, and west of the South Big Island area, in northern Avoyelles Parish, Central Louisiana.

Power Rig Drilling Co., Lafayette, La., has a new operation under way for Magnolia Petroleum Co. on the Beauregard Parish side of Clear Creek field, in southwestern Louisiana. It is a 9,500-ft. test at 1 Anderson, in 10-6s-8w. **Penrod Drilling Co.,** Shreveport, has a new 9,300-ft. test under way

W. H. Manry (left), tool pusher for Production Service Oil Corp., Houston, and some of his crew on a rig the company has been operating in the Houston area. Crewmen, left to right, are: Al Hughes, E. J. Luther, Louis Coleman, and C. D. Williams. Picture was taken on a recently completed well at Pierce Junction, at the southeast edge of Houston.

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Cut shop expense on your drill collars by using 'Bestolife Lead Seal. Because of its high percentage of powdered metallic lead, 'Bestolife is heavy enough to stay on threads and shoulders instead of being squeezed out. This gives you extra tight leak-free joints, which are easy to break out. That's why 'Bestolife is first choice with tool pushers all over the world. See your local supply store for 'Bestolife. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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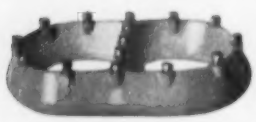

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for H. L. Hunt in the adjoining Allen Parish sector of the field. Its operation is at 3 Perkins, in 5-6s-7w.

Don Crosby Drilling Co., Houston, is drilling for The Texas Co. at a wildcat location 5 miles northwest of Kinder, in Allen Parish, southwestern Louisiana. The operation is at 1 Rice, in 32-5s-5w. Scheduled depth is 10,000 ft.

Fleeger-Riley Drilling Co., Inc., Dallas, has contracted with Amerada Petroleum Corp. for a 7,800-ft. Dakota test near Ignacio, in southeastern La Plata County, southwestern Colorado. Location is in 17-33n-8w. Drilling will be done with gas. The contractor has been active in this area the past 4 years.

Gilger Drilling Co., Ltd., Houston, has scheduled a 10,000-ft. wildcat test to be drilled for J. R. Frankel, also of Houston, about 5 miles south of Lake Charles, in Calcasieu Parish, South Louisiana. Location, at 1 Northrup, in 33-10s-8w, is 1½ miles north of the old South Lake Charles area, and about 6 miles west of Holmwood field.

R. P. Bufkin, Pleasant Hill, La., is contractor on two new shallow operations in Natchitoches Parish, West-Central Louisiana. One is a 3,500-ft. Paluxy test for S. E. Prichard in the Ajax area. It is at 1 Martin, in 19-10n-10w, about ⅝ mile from production. The other is a 1,350-ft. Nacatoch test for E. C. Wentworth at 1 Bierdon, in 36-11n-10w, Lake End area.

Continental Drilling Co. is drilling another deep test for S. J. Seidl, of New Orleans, off the east flank of the Fausse Point dome, on the Iberia-St. Martin parish line, in southern Louisiana. The new test, 2 Seidl-Gonsoulin, follows that of 1 Seidl-Gonsoulin, in the same section (10-11s-9e), abandoned early in August as dry at 9,812 ft. Both are on the St. Martin Parish side of area, about 1½ miles from nearest production on the dome.

Delta Gulf Drilling Co., Tyler, Tex., has two new deep contracting operations scheduled for South Louisiana, one for Stanolind Oil & Gas Co., in the Thibodaux area, Lafourche Parish, and the other for Cities Service Oil Co., in the Fausse Point area, St. Martin Parish. Stanolind's job, 1-B Levert, is the southeast offset to J. R. Frankel's discovery well, completed a year ago with gas-condensate production from an 11,900-ft. sand. Cities Service's test, on State Lease 2595, a northeast extension test, is scheduled to go to 15,000 ft.

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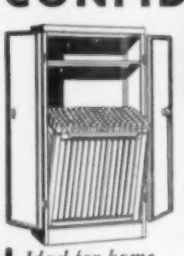

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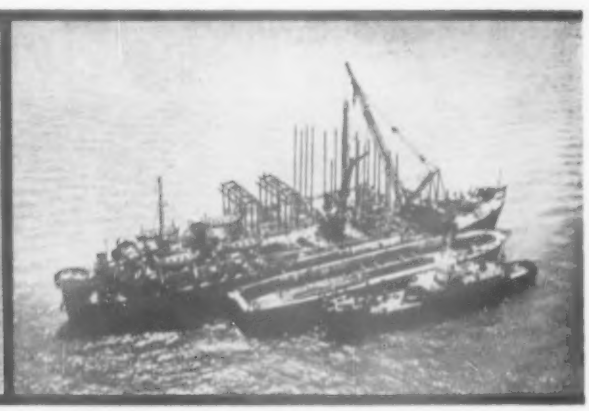

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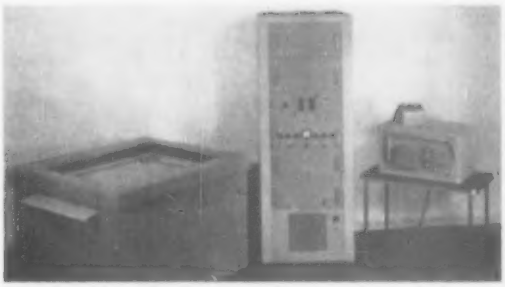

Electroplotter Plots Seismograph Data

The geophysical plotter (Electroplotter Model S) is designed for the specific application of plotting seismographic data such as profiles.

It provides for the plotting of a short line at an angle corresponding to the dip angle of the stratum with the center of this line appearing at specific X-Y coordinates. Reflection quality is indicated by printing lines of different types. The Electroplotter will accept information from a variety of inputs such as I.B.M. or Remington Rand punched cards, punched-paper tape, or a manually operated key board. This unit consists of a plotting table, a control console, a tape-reading unit (where tape input is required), and a keyboard.

The print mechanism includes provision for automatically printing in the center of the reflection line a six-digit number which can refer on demand to digital information on the punched cards or punched tape (i.e., shot-point number, time of reflection, etc.)

The plotting area is 30 by 40 in., with provision for handling roll paper up to 40-in. nominal width. A vacuum paper-holddown system is provided for smooth wrinkle-free paper holddown.

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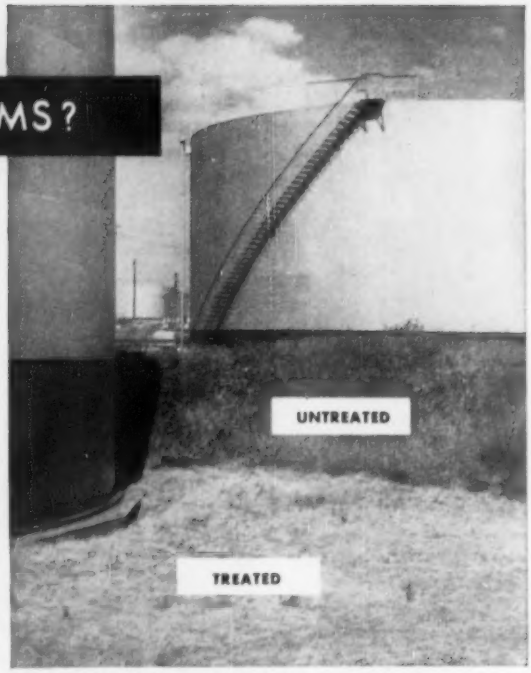
WEED KILLERS

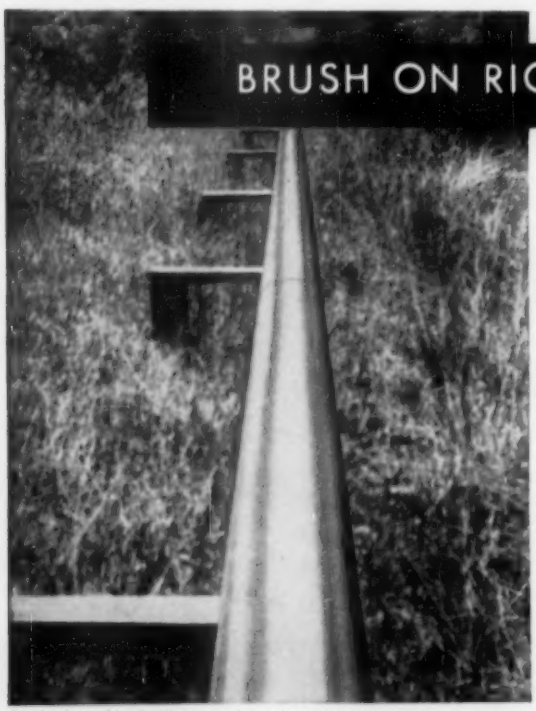
stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.



"Telvar" is ideal for weed control around tank farms, pipelines, pumps and derricks. It's non-toxic to humans and animals, non-flammable, non-volatile and non-corrosive to equipment.

BRUSH ON RIGHT-OF-WAY?



Brush along this pipeline was cleared and kept down with "Ammate." "Ammate" allows low-growing cover to return to resist erosion.

One application of **Du Pont Ammate**®

WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

Telvar® Weed Killers for industrial use

DU PONT REG. U. S. PAT. OFF.

Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

provided to select the location of the minimum and maximum values on the graph paper. Full range in X or Y, from —9999 to +9999 may be plotted to a full scale of 40 in. or compressed as small as 4 in. Angular rotation will normally have its zero origin in the horizontal position and full scale of ±90° can be represented by —90.0 to +90.0 or —999 to +999. **For more information write or call: Benson-Lehner Corp., 11930 Olympic Boulevard, Los Angeles 64, Calif.**

•

Breathers, Drains Are for Humid, Hazardous Areas

This new, stainless-steel universal breather and drain (shown above at pencil point and in the top of the detached cover at right) allows the passage of three to four times more volume of air than standard types. The new type ECD devices are for use on explosionproof combination starters and circuit breakers, and other equipment housings in Class I, Groups C and D hazardous locations.

These breathers and drains have two functions: (1) to drain off accumulated water, resulting from condensation, in the base of the explosionproof housing; (2) to ventilate the housing by allowing constant circulation of air, thus minimizing condensation. Additionally, larger air passages prevent clogging.

The new units can be installed in explosionproof housing by screwing them into hubs or holes, tapped for conduit, having five or more threads. This connection assures complete safety, since at least five threads on the breathers and drains will be engaged. **For more information write or call: Crouse-Hinds Co., Wolf and Seventh North Streets, Syracuse, N. Y.**

•

Thick-or-Thin Seals Nonprecision Threads

Jet Lube Thick-or-Thin sealing compound lubricates and makes a tight pressure seal on line-pipe threads, flanges, and pressure gaskets. Insoluble in oil, gas, and water, it can be thickened to stiff consistency for putty-knife application, as a flange and gasket paste by simply adding water, or can be thinned with solvent for brush or spray application.

Special chemically inert filler, combined with pure metallic lead and graphite, provide a matrix in thread grooves and between gasket faces to form a slightly malleable seal. A flexible but tough, polymerized film forms upon exposure, but the exposed compound remains nonhardening. Vibration, impact, or surge will not rupture seal. Low evaporation loss resists drying action of superheated steam. **For more information write or call: Jet Lube, Inc., 3093 North California Street, Burbank, Calif.**

Florex—for adsorption

Recognized throughout the world as superior to all other natural clays used in adsorption processes, Florex is particularly effective in the adsorptive refining, decolorization, clarification and neutralization of mineral, vegetable, and animal oils, fats and waxes. Florex is also effectively used for sweetening light distillates, dehydration, desulfurization and polymerization.

Florex is prepared from carefully selected natural Florida Fullers Earth by a special processing including high-pressure extrusion, which greatly improves adsorptive efficiency and capacity.

Standard particle sizes are herein reproduced and include meshes from 2/4 to 200/ up. Special meshes are also available. Florex is packaged to fulfill customer's requirements with the Fifty (50) pound non-returnable paper bag the minimum quantity.

For further information use free request coupon below.

FLOREX MESH—ACTUAL SIZE

100-UP
60/100
30/60
16/30
8/16
4/8
2/4

FLORIDIN COMPANY

• Adsorbents
• Desiccants
• Diluents

P. O. Box 998 Dept. C
Tallahassee, Florida

Please send literature ☐ and sample ☐ of Florex
(Be sure to indicate mesh size.....)

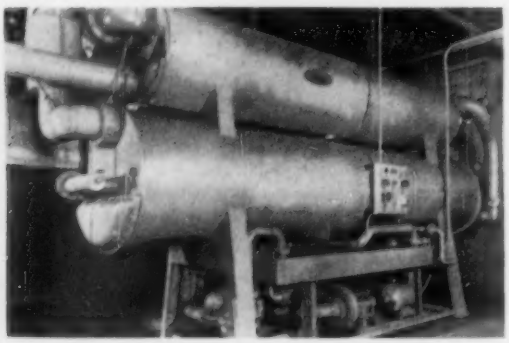
Name.....

Address.....

City.....

OIL AND GAS JOURNAL *Showcase*

.....OF NEW EQUIPMENT



Absorption Machine Has No Moving Parts

Absorption refrigerating machines which have no major moving parts and produce chilled water from hot steam, are now available for large-capacity process-cooling installations in a wide range of 11 sizes from 100 to 700 tons.

The new type of absorption machines, which will adjust automatically from fulldown to virtually zero load with little loss in efficiency, are designed to produce low-cost cooling wherever an economical source of heat such as natural gas is available.

They are also highly suitable when a source of steam is already available from a boiler, or as a byproduct of a process using steam.

Since the machine operates on low-pressure steam (12 psig.) which may also be obtained from back-pressure turbines or exhausted from various processing operations, it can provide chilled water for process chilling at little operating cost.

Due to its light weight and lack of moving parts the absorption machine can be installed anywhere in the plant, on structural steel, or on top of process columns, putting the unit close to process requirements. Its sturdy vertical assembly occupies a minimum of space, which facilitates installation where space is at a premium.

The machine usually uses steam to produce refrigeration. However, any source of fluid heat such as hot water, hot oil, or chemicals may be employed. Although water is usually the fluid to be chilled, process steam and many gases may be chilled and condensed as well. **For more information write or call: Carrier Corp., Syracuse, N. Y.**

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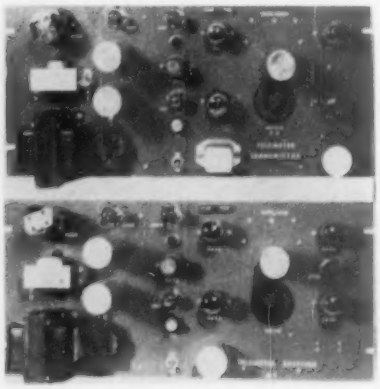

Telemeter System Operates With Resistance Transducers

The Model 100 telemeter system is a simple, stable receiver-transmitter set designed for the transmission of operational data or control signals along a telephone line between distant points. The system operates on the principle of pulse-rate carrier-modulation with the input signal to the transmitter derived from a variable resistance. The output signal from the receiver is an electrical signal for the operation of conventional recorders and/or control devices.

This telemeter system has been designed to operate with resistance transducers which translate such parameters as motion, pressure, temperature, acceleration, and strain as a resistive change at the output terminals. In general the data transducer has the form of a mechanically operated potentiometer. The addition of a potentiometer to the pen-drive mechanism of a remote recorder is all that is required with the telemeter system to accurately repeat and duplicate the data at a centrally located control station. Two sets of the telemeter system may easily be connected in a bidirectional installation to produce a long-distance feedback loop for remote control and automatic operation. A typical application is found in the transmission of pipeline - interface - arrival information from a cut-point indicator at a remote pumping station to the tank farm for more positive control of the transportation scheduling. **For more information write or call: United Engineers, Inc., 820-824 East Sixth Street, Tulsa, Okla.**

●

OIL AND GAS JOURNAL *Showcase Coupon*

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ **STATE** _____

Please send me complete information on the following item

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_____

Described in the Sept. 12, 1955 **Issue of The Oil and Gas Journal**

NAME _____ **TITLE** _____

COMPANY _____

ADDRESS _____

CITY _____ **STATE** _____

DATE _____

Thirteen SKF bearings are "Lucky Number" in the Failing "1500" holemaster drill

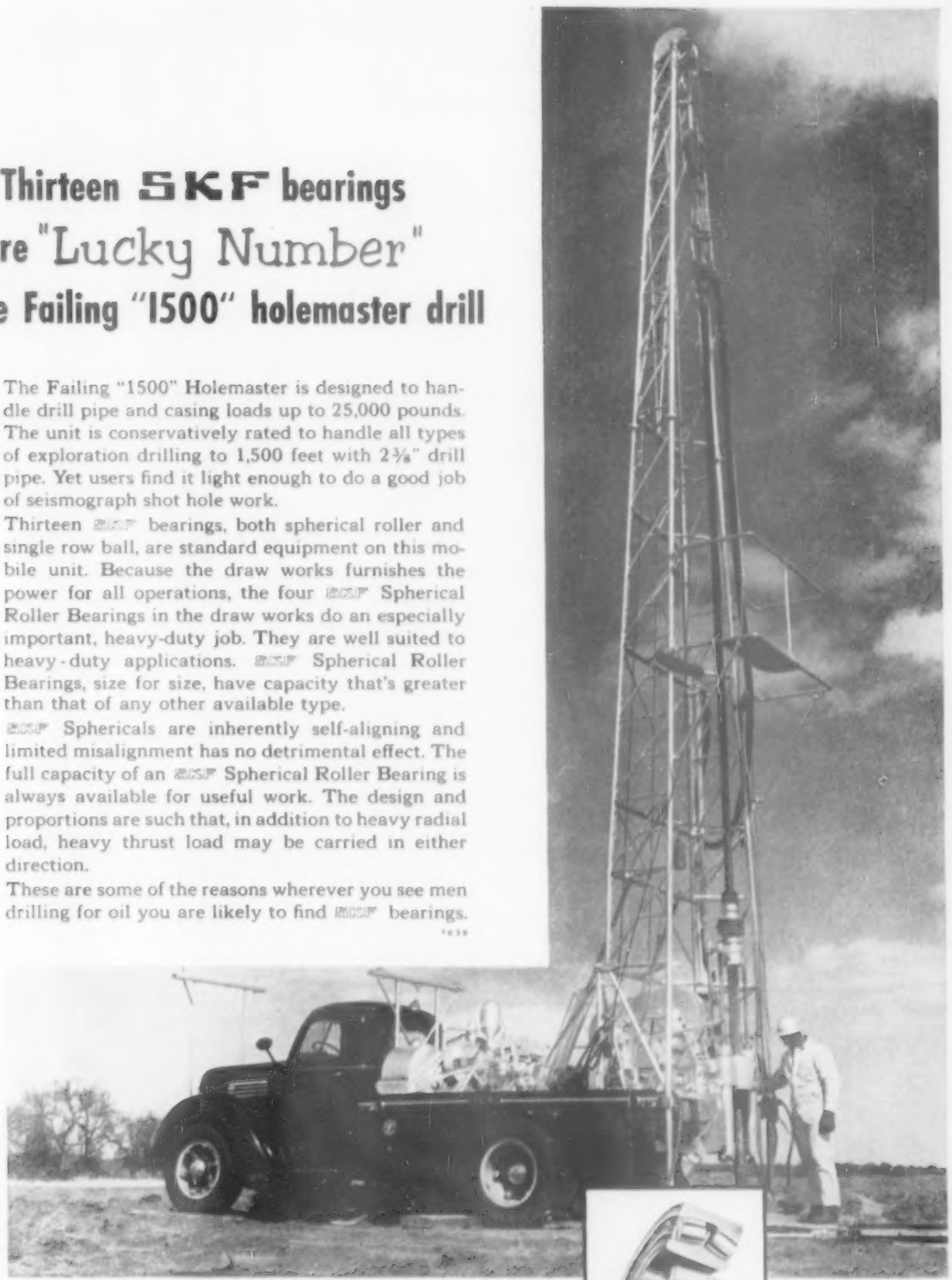
The Failing "1500" Holemaster is designed to handle drill pipe and casing loads up to 25,000 pounds. The unit is conservatively rated to handle all types of exploration drilling to 1,500 feet with 2⅜" drill pipe. Yet users find it light enough to do a good job of seismograph shot hole work.

Thirteen SKF bearings, both spherical roller and single row ball, are standard equipment on this mobile unit. Because the draw works furnishes the power for all operations, the four SKF Spherical Roller Bearings in the draw works do an especially important, heavy-duty job. They are well suited to heavy-duty applications. SKF Spherical Roller Bearings, size for size, have capacity that's greater than that of any other available type.

SKF Sphericals are inherently self-aligning and limited misalignment has no detrimental effect. The full capacity of an SKF Spherical Roller Bearing is always available for useful work. The design and proportions are such that, in addition to heavy radial load, heavy thrust load may be carried in either direction.

These are some of the reasons wherever you see men drilling for oil you are likely to find SKF bearings.

7639



SKF®

BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.,
manufacturers of SKF *and* HESS-BRIGHT® *bearings.*

OIL AND GAS JOURNAL Showcase
..... OF NEW EQUIPMENT

Small Swivel Joint Is Made in Two Sizes

A new small swivel joint is made in two styles, one for free, easy turning, and the other with a drag or torque controlled by simply turning the Allen-head screw which actuates an internal-brake shoe. The Swivel Ette is, in effect, a union connection and may be used as such.

The Swivel-Ette is made of a special die-cast alloy known as Zamak 5 and is available in ½ and ¾-in. internal-pipe sizes. The joint is made to rotate 360°, and is intended for occasional, or for intermittent turning, rather than for continuous rotation. It is ideal for

hose lines where flexing and weaving are encountered. The fitting is conservatively rated at 300 psi. cold-working pressure for water, oil, and air, and for temperatures up to 225° F.

The unit is of two-piece construction spun together at assembly. After a long period of hard usage, it is replaced rather than repaired. Actually, cost of replacement is less than the cost of repairing other types of joints. **For more information write or call: Emsco Manufacturing Co., Box 2098, Terminal Annex, Los Angeles 54, Calif.**

•

T-I-W Packer Can Be Set With Low Tubing Weight

This T-I-W Hydraseal packer was designed to permit a low tubing weight to set the packer, as required in permanent-completion well techniques. The packer is suited for testing single or dual-zone formations, acidizing or water injection, testing casing and cement jobs, hydraulic fracturing of formations, and single and dual completions.

The outstanding feature of the packer is the reinforced-synthetic-rubber cups. These permit pressure to be held from either direction. Ample bypass area and a solid mandrel permit circulation through and below the packer. **For more information write or call: Texas Iron Works, 1423 Maury St., Houston 10, Tex.**

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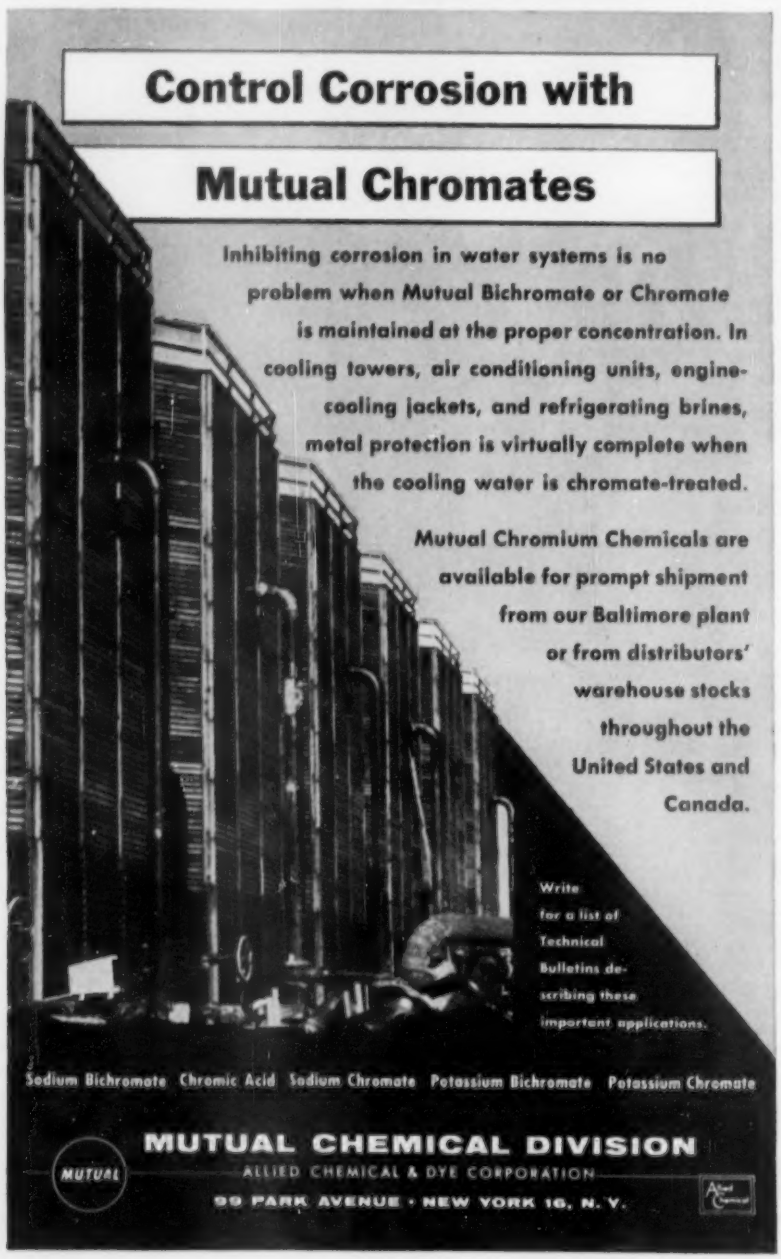
Hydraulic Starter Is Unaffected by Temperature

A new hydraulic starting system for diesel engines, called the Hydrostarter, consists of a hydraulic motor, a piston-type accumulator, an engine-driven


Control Corrosion with
Mutual Chromates
Inhibiting corrosion in water systems is no problem when Mutual Bichromate or Chromate is maintained at the proper concentration. In cooling towers, air conditioning units, engine-cooling jackets, and refrigerating brines, metal protection is virtually complete when the cooling water is chromate-treated.
Mutual Chromium Chemicals are available for prompt shipment from our Baltimore plant or from distributors' warehouse stocks throughout the United States and Canada.
Write for a list of Technical Bulletins describing these important applications.
Sodium Bichromate Chromic Acid Sodium Chromate Potassium Bichromate Potassium Chromate
MUTUAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
99 PARK AVENUE • NEW YORK 16, N. Y.
MUTUAL

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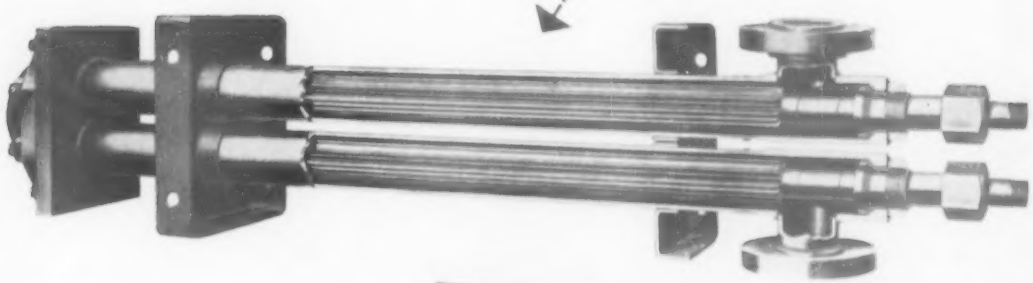


Unmatched Simplicity:

The simplest heat exchanger on the market. *Simple design*—no tube sheets, baffles and internal joints. *Simple installation*—easily stacked and connected in series or parallel. *Simple maintenance*—no stuffing boxes, no rolled tube joints, no gaskets. Simple and effective shell end-closure.

Unmatched Versatility:

Readily converted from one service to another. Can be used for practically any condensing, cooling, heating or heat exchanger service. G-Fin elements and fins available in any ferrous or non-ferrous metal best suited to your specific applications.

Over 70,000 G-R Salesmen on the job!

Are seventy thousand salesmen enough to persuade you that the G-R Twin G-Fin Section is a superlative unit? Seventy thousand is the number of trouble-free G-R Twin G-Fin installations made over a period of 20 years. Some of these installations have been operating continuously for the entire period—a record unmatched in the industry.

THE GRISCOM-RUSSELL CO.
MASSILLON, OHIO
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

G-R
HEAT TRANSFER APPARATUS

Twin G-Fin Section

GR 3472

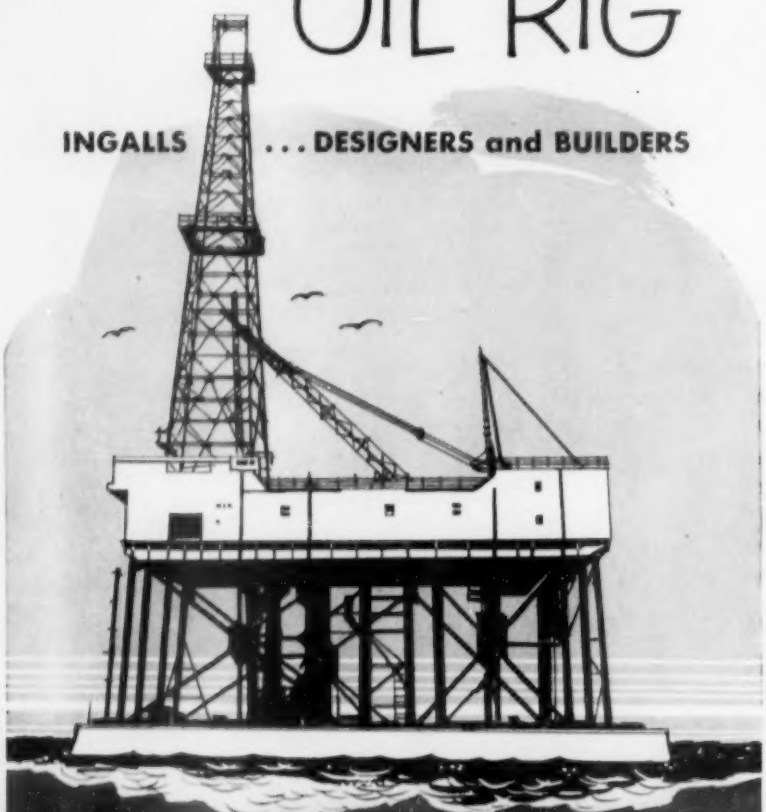
pump, a reservoir, and a manual pump. No outside source of energy is needed. After the accumulator has been loaded and sealed with an inert gas, an engine-driven pump maintains pressure and the manual pump permits emergency recharging.

The Hydrostarter was specially engineered to operate in remote installations where cold weather and frequent periods of equipment inactivity can be detrimental to conventional electrical-starting equipment.

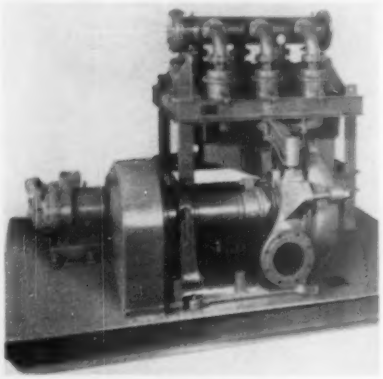
Temperature has little effect on the new starter. In laboratory and field tests at subfreezing temperatures, the hydraulic unit's high torque and fast acceleration provides engine speed far beyond present normal starting speeds in less than one-half second. The starter's high static torque, 80 ft.-lb. at 3,000 psi., delivers top performance under extremely adverse conditions. **For more information write or call: Aeroproducts Operations, Allison Division, General Motors Corp., Phone Belmont 1541, Speedway City, Indianapolis 6, Ind.**

Seagoing OIL RIG

INGALLS ... DESIGNERS and BUILDERS



FOR COMPLETE INFORMATION, WRITE:
The INGALLS Shipbuilding Corporation
BIRMINGHAM, ALABAMA



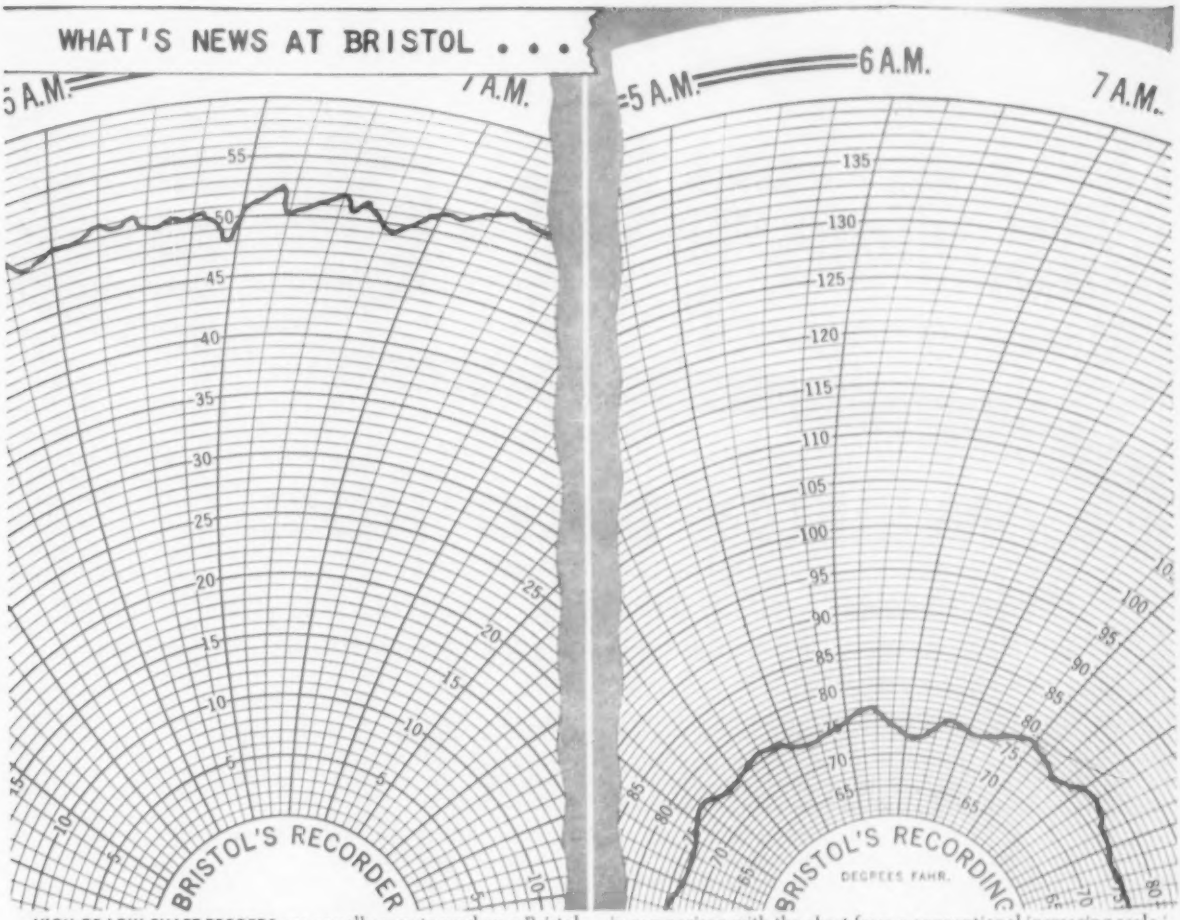
D-Sander Consists of Centrifugal Classifiers

The Dorreo D-Sander, a new unit for removal of sand from rotary-drill mud is a battery of 6-in. FR DorrClones or centrifugal classifiers. In commercial-scale field tests, effective removal of sand, using this new unit, has substantially decreased the cost of the drilling operation by reducing both drilling time and wear on drill bits and mud pumps.

The Dorreo D-Sander comprises, in addition to the wet cyclones, a mud pump and power unit. Depending upon the volume of mud to be processed, the cyclone battery includes either four or six DorrClones with removable Hycar liners. The power unit may be either a gas or gasoline engine, steam turbine, diesel engine, or electric motor.

When used on a land rig, cyclones, power unit, and pump are mounted on a portable skid. For barge rigs the cyclone assembly is supported on a frame. The skid, however, is eliminated so that the three major elements may be located wherever space permits.

In operation, mud from the storage tanks is pumped into the cyclones through a common header at 20 to 30-lb. psi. Centrifugal force makes approximately a 200-mesh separation and throws the coarse, +200 mesh sand outward and downward to the underflow from which it is discharged to waste. Overflow, relatively free of sand, is returned to the sand pit. A six DorrClone D-Sander will handle 600 to 800 g.p.m., while the capacity of a four-unit machine is 400 to 500 g.p.m. **For more inforamtion write or call: Dorr-Oliver, Inc., Phone, FIreside 8-7311, Stamford, Conn.**



HIGH OR LOW CHART RECORDS are equally easy to read on a Bristol 2DL Recording Vapor-Pressure Actuated Thermometer . . . in comparison with the chart from a conventional increasing scale vapor-pressure recording thermometer shown above.

Bristol leads with linear scale vapor-pressure actuated recording thermometer

Tagged by instrument men as "the greatest advance in 25 years of recording thermometer building," Bristol's 2DL vapor-pressure actuated recording thermometer has a uniform linear scale that's equally easy to read at any point in its range.

It's another example of Bristol's "Human-Engineering" that means greater operating convenience, fewer errors, and easy visual interpolation.

MORE GOOD NEWS! In addition to this new high in readability throughout the entire measured range, Bristol has eliminated ambient temperature effects to boost the inherent accuracy of the recording thermometer still further.

GET ALL THE FACTS about these rugged precision instruments. Write today for free 48-page Bulletin T840 – it tells all about typical installations, ranges, charts, bulbs, and tubing. The Bristol Company, 120 Bristol Road, Waterbury 20, Conn.

5 20

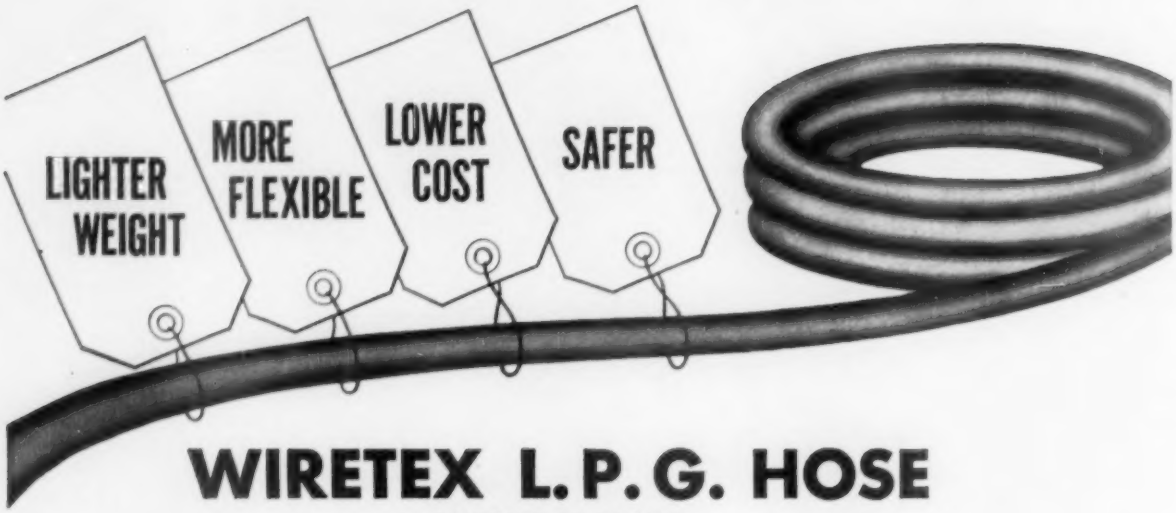
HIGH-SPEED RESPONSE AND ACCURACY are key advantages of the new Bristol Vapor Pressure Recording Thermometers.

BRISTOL

BRISTOL'S

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS



WIRETEX L.P.G. HOSE

BUTANE-PROPANE

LIGHTER WEIGHT— lighter by 28% than fabric reinforced hose in the popular ¾" size.

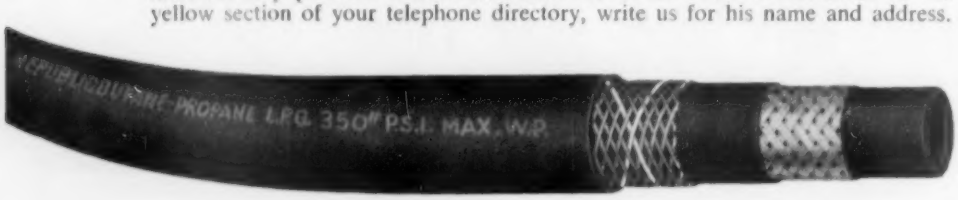
MORE FLEXIBLE— because of its wire-braid construction; easier to handle, too—in all sizes!

LOWER COST— than fabric reinforced hose.

WIRETEX L.P.G. Hose has built-in safety factor in the strength of the steel wire-braid reinforcement. For further safety, there are two static-dissipating wires spiralled into the textile braid, which forms a bond between the reinforcement and the cover.

The Reprene tube is especially compounded to handle liquid butane and propane which would be destructive to ordinary rubber. The abrasion-resisting rubber cover is colored RED for easy identification. WIRETEX L.P.G. Hose is your most economical conductor of liquid petroleum gas.

Your local Republic Distributor can help you plan, select, apply and maintain any product of Industrial Rubber. If his name is not listed in the yellow section of your telephone directory, write us for his name and address.



WIRETEX L. P. G. HOSE is available in lengths up to 60' in a full range of sizes from ½" to 2" inclusive.

SPECIFICATIONS

Spec. Number	Size I.D.	Wire Braid	Approx. O.D.	Approx. Wt. Lbs. Per 100'	Max. Wkg. Pressure Pounds	Std. Pkg. Qt.
W-63-50	½"	1	⅞"	37#	350#	240'
W-63-75	¾"	1	1 3/32"	53#	350#	240'
W-63-100	1 "	1	1½"	72#	350#	240'
W-63-125	1¼"	1	1⅝"	105#	350#	120'
W-63-150	1½"	1	2 1/16"	135#	350#	120'
W-63-200	2 "	1	2⅜"	170#	350#	60'

"Quality Hose Builders for Over 50 Years"

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Hydramotors Catalog illustrates the design features and application of these motor-operated valves to fluid-control problems. Features include: single-seat design for tight closure, electro-hydraulic action with no gear-train problems, solid construction with sealed power unit, an oil-immersed power unit that is impervious to weather, and spring-load return to safe position if power fails. **For more information write or call: General Controls, 801 Allen Avenue, Glendale, Calif.**

●

Coated Anode for Marine Applications. This four-page data sheet discusses effective cathodic protection of marine structures against corrosion attack by sea water. Line drawings and graphs depict an improved anode in 24 and 44-lb. sizes. Illustrations show the results of using coated and uncoated anodes. **For more information write or call: The Dow Chemical Co., Midland, Mich.**

●

Catheads and Hydraulic Tubing Tong. Catalog 21 features the trailer-mounted hydraulic tubing tong and also illustrates a complete line of spinning and breakout catheads and the jerkline tension indicator. Installation data and parts lists for all products are included. **For more information write or call: Foster Cathead Co., P. O. Box 1351, Wichita Falls, Tex.**

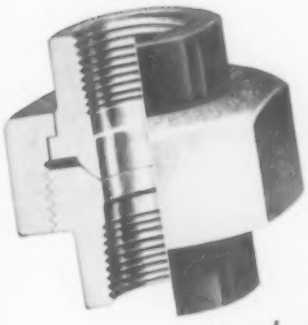
●

Complete Facilities for Fabricating-Machining Requirements is a new four-page folder covering the facilities and fabricated products of Joe Stine, Inc. Specialties include hydraulic jacks or offshore equipment, as well as usual derrick and rig fabrications, such as mud tanks, work benches, and substructures. **For more information write or call: Joe Stine, Inc., P. O. Box 14471, Houston 21, Tex.**

●

Sensitive Thermocouples. Specification Sheet 57 describes new two-wire thermocouples, with outside diameters of ⅛ and 3/16 in. These are for use where sensitivity and accuracy are important,

UNDER THE TOUGHEST CONDITIONS . . .



HIGH OR LOW TEMPERATURES AND PRESSURES

as always, you'll find forged steel

"PETRO" A. A. R. UNIONS do the job, superbly!

A NEW CATALOG FULLY DESCRIBES OUR ENTIRE LINE
WHY NOT WRITE FOR YOUR FREE COPY . . . TODAY!

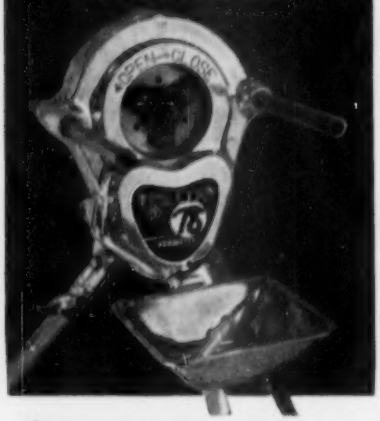
Clayton Mark & Company
1900 DEMPSTER STREET EVANSTON, ILLINOIS U.S.A.

Cleveland "140" speeds relocation of 12-inch gas line to new bridge across Rio Grande River

MERMIS CONSTRUCTION COMPANY'S Model 140 Cleveland Trencher is doing a fast job of cutting 3,000 feet of trench, 2 feet wide by 4 feet deep, for the relocation of a 12-inch gas line to cross the Rio Grande River on a new bridge near Albuquerque, New Mexico. The job is being done for the Southern Union Gas Company. This Cleveland—the standard trencher for work from 18 to 30 inches wide down to 5½ feet deep—has been an outstanding performer on trenching jobs of all types, from big cross-country pipelines to small diameter utilities distribution lines. Get the full story from your Cleveland distributor. THE CLEVELAND TRENCHER CO., 20100 St. Clair Ave., Cleveland 17, Ohio.

It's Amazing!

THE TOLEDO NO. 78 VERMETTE POWER DRIVE



★ **WEIGHS ONLY 73 POUNDS**
A real heavy-duty, lightweight

★ **RAPID, POSITIVE CHUCKING**
Grips like a pipe wrench—self centering

★ **CONSERVES TIME AND ENERGY**
The most advanced and versatile machine on the market

★ **BETTER BUILT TO LAST LONGER**
No belts — sturdy — powerful

A time proved, PORTABLE power drive providing effortless cutting, threading and reaming of pipe and conduit . . . a worthy addition to "TOLEDO's" well known line of quality pipe tools. Fully guaranteed. Handles up to 2" sizes . . . grips, tightens and centers pipe automatically, forward or reverse. It's the lightest portable power drive of its kind. And remember . . . if it bears the "TOLEDO" label . . . you know it's a dependable product.

Write today for new free bulletin with conclusive proof of superiority. Your "TOLEDO" supplier has all the facts.

TOLEDO PIPE THREADING MACHINE COMPANY
TOLEDO 4, OHIO

BUILDERS OF THE WORLD'S FINEST PIPE TOOLS
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PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

and where space is limited. They are available in lengths from 6 to 72 in., and can be furnished with small open terminal-block assembly, general-purpose head, or screw-cover terminal-head assembly. **For more information write or call: W. A. Lang, Product Editor, Industrial Division, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Avenues, Philadelphia 44, Pa.**

●

Large Savings in Main Line Metering. A four-page color bulletin tells of the large savings in power realized through the utilization of a venturi-insert nozzle designed for metering liquid, steam, air, or gas. The bulletin shows how the smooth, stream-lined contour of the inlet, the specially lined throat with annular chamber and multiple vents, together with the special outlet cone, obtain high-pressure head recovery and long retention of initial accuracy. Other advantages include low head loss; easy installation due to self-contained metering taps; minimum maintenance due to simplicity of construction and unobstructed flow path; and available pressures limited only by main pipeline as a result of insert design. **For more information write or call: Builders-Providence, Inc., 345 Harris Avenue, Providence, R. I.**

●

High-Pressure Equipment. Catalog No. 2055 describes high-pressure valves, adapters, autoclaves, thermocouplings, gages, fittings, and tubing. **For more information write or call: High-Pressure Equipment Co., Inc., 1222 Linden Street, Erie, Pa.**

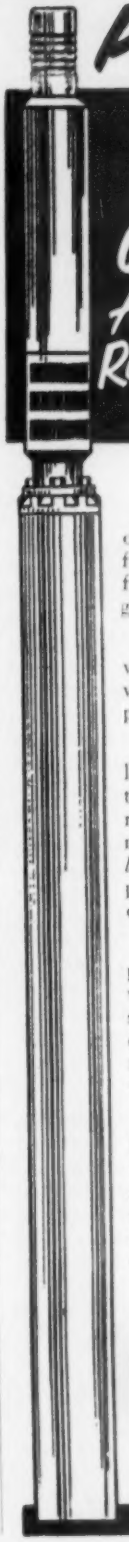
●

Concrete River Weights, a new eight-page brochure, describes the exclusive features of bolt-on type hinged concrete weights for large-diameter pipe. Special processes of mechanical applications of concrete coating by means of equipment for pipe from 10 to 36 in. is shown. A patented coating system for pipe smaller than 10 in., and particularly adapted for offshore use, is presented, as well as methods for calculating pipe displacement. **For more information write or call: The Anchor-Wate Co., P. O. Box 12185, Houston 17, Tex.**

●

Preparation of Petroleum Feeds for Platinum Catalysts is the title of a 12-page technical study. Discussion covers the effective reduction or removal of harmful constituents such as arsenic, lead, sulfur, and nitrogen compounds by a specially processed group of Attapulgus clay products. Aspects of processing scheme, plant design, clay de-

REDA PUMPS



FIRST CHOICE for Secondary Recovery Water Flooding ...

The lower the expense of producing source water from wells for water flooding operations, the greater the ultimate profit.

Reda Pumps for source water wells provide many ways for lowering these production costs.

Improved design and longer operating life *lower* the cost of labor per barrel, *lower* the cost of maintenance per barrel, *lower* the investment cost per barrel, *lower* the cost of fluid per barrel.

Also the ability of Reda pumps to produce greater volumes in limited casing sizes and from greater depths often reduces the number of source water wells required.

Reda engineers have long been associated with water flooding operations and are fully qualified to assist operators in discussing their source water requirements.

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PUMP COMPANY
BARTLESVILLE, OKLA.

WHAT'S THE SHAPE OF THE HOLE?

There comes a time on every well when "it's money in the bank" if you know the shape of the hole. A cavity here . . . a mud cake there . . . in other places the hole to gauge. All this, you see at a glance on the **Schlumberger Section Gauge** Survey—information which is often essential for testing, cementing and log interpretation.

The Schlumberger Section Gauge gives you details about the hole size to a diameter of 36 inches. Its dependable operation has guided thousands of operations to successful completion. When in doubt, call your Schlumberger Engineer. It's best to be sure on every survey.

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NOW! Lowest Prices!

Highest Powered Dodge Trucks Ever Built!

LOWEST PRICES! Many standard models of Dodge trucks are priced lower than all other makes! Yet with these low prices, quality-built Dodge trucks are dependable as ever.

HIGHEST POWER! Power-Dome V-8 engines, with 169 to 202 hp., are the most powerful of any leading trucks. Save time, save on operating costs, with these short-stroke V-8's! You'll save with Dodge thrifty 6's, too!

THE FORWARD LOOK! Now Dodge brings the Forward Look to trucks. New wrap-around windshield (biggest of any make!) means added visibility and safety! More reason why you should look at Dodge before you buy any truck. Why not phone your dependable Dodge truck dealer, today?

DODGE *"Job-Rated"* TRUCKS WITH THE *FORWARD* LOOK!

scription, and costs are covered. Six tables and eight graphs present valuable supporting technical data. **For more information write or call: Minerals & Chemicals Corp. of America, 210 W. Washington Square, Philadelphia 5, Pa.**

●

Model 4 Electronic Vibraswitch. Bulletin 500-4 covers the many applications for equipment used for monitoring vibration in pump motors, diesels, gas engines, turbines, and other rotary equipment. Vibration monitoring is a sure way of detecting malfunction before costly damage occurs. **For more information write or call: The Beta Corp., P. O. Box 8625, Richmond 26, Va.**

●

Drill-Pipe Protector Rubbers, a one-page data sheet printed in two colors, features the advantages of protectors that stay put after being run in the hole. Of particular interest is the rubber compound which is wear resistant, corrosion resistant, and remains effective in high temperatures. **For more information write or call: The Guiberson Corp., 1000 Forest Avenue, P. O. Box 1106, Dallas, Tex.**

●

For Permanent Completions. This new catalog lists solid-line wipers, measuring-line stuffing box, wire-line control head, wire-line blowout preventer, lubricator tool trip, electronic weight indicator, wire-line jar, and link jar. Each item is accompanied by complete parts, price, and engineering data. **For more information write or call: Bowen Co. of Texas, Inc., P. O. Box 4587, Houston 13, Tex.**

●

Oil-Field Ropes presents construction details and specification data on steel-wire ropes, galvanizing, manila, and sisal ropes, nylon ropes, well-measuring lines, guy strand, sheave sizes, stainless-steel lines, Blue-Strand preformed rope. It also offers information on rope lubrication, care and maintenance, installation, and handling of wire ropes. **For more information write or call: F. Siswick, British Ropes, Ltd., 52 High Holborn, London, W.C. 1, England.**

●

Causul-Metal Gate Valves, designed for corrosive service, is an informative, illustrated circular. Causul-metal gate valves are available in bolted bonnet or King-Clip patterns, with screwed or flanged ends and in sizes ranging from ½ to 8 in. Two trims are available, i.e. 18-8 moly. (Type 316) stainless steel or monel metal. These valves have proved eminently successful for handling corosive fluids in refineries. The

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For absolute wire rope safety on the job, insist on CROSBY CLIPS to safeguard men and equipment. They're drop forged for maximum strength and hot-dip galvanized for extra durability.

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get ALL the facts

and you'll choose

FIELDMASTER
BALL BEARING
MOTORS

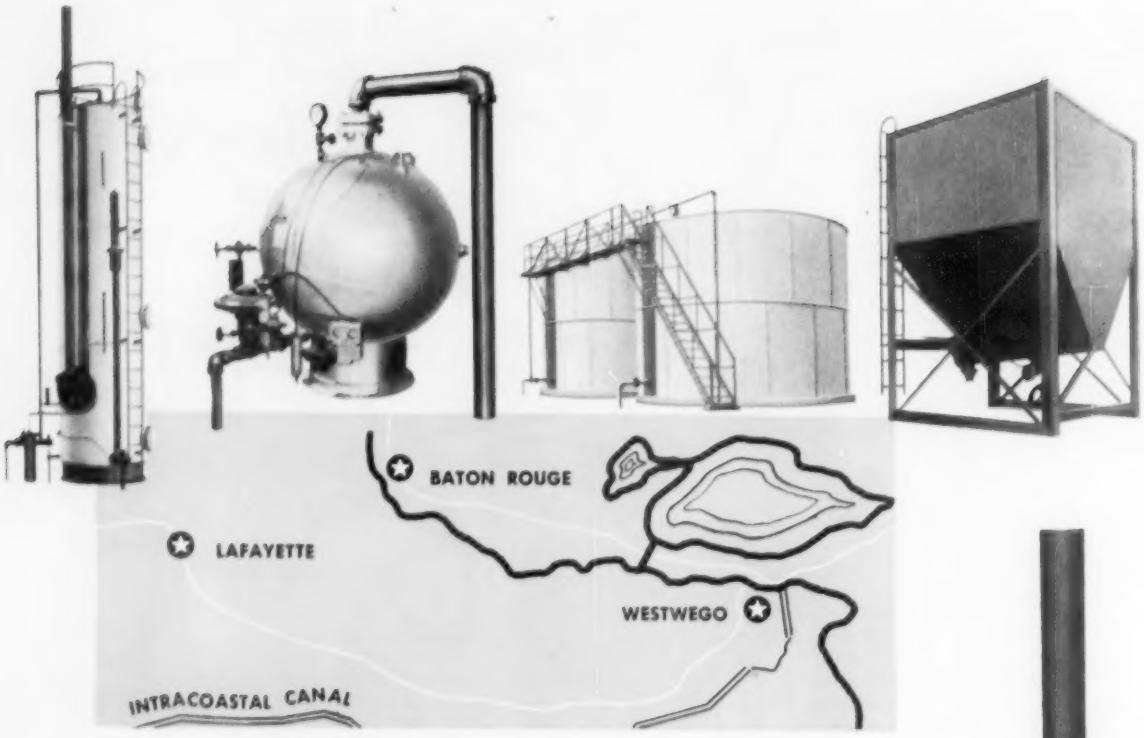
Like a book, you can't tell a motor by its cover; it's what's inside that counts.

FIELDMASTER Ball Bearing Motors, for example, have been specially designed and built to more than handle the rugged requirements of oil field use. High slip is available to take care of reciprocating load requirements encountered in pumping . . . wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems . . . high-grade silicon steel in the magnetic circuit reduces iron losses . . . heavy-duty, double-shielded pre-lubricated bearings increase performance, reduce lubrication problems . . . heavy cast base assures alignment stability.

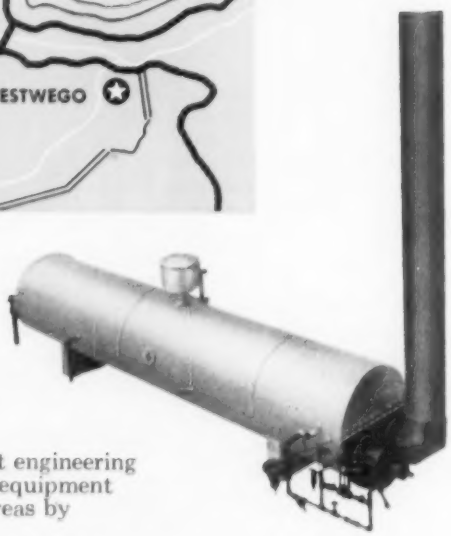
These are just a few of the many facts which prove FIELDMASTER Ball Bearing Motors are second to none. Our distributor, the Bethlehem Supply Company, will gladly supply you with ALL the facts . . . **without obligation.** May we have them contact you?

Screened Air Port Keeps Out Rodents!

VALLEY ELECTRIC CORP. 4221 FOREST PARK BLVD., ST. LOUIS, MO.
Distributor, BETHLEHEM SUPPLY CO., TULSA, OKLA.



CALL THIS NEW, MORE CONVENIENT SOURCE OF SUPPLY FOR OIL FIELD EQUIPMENT



Faster delivery, lower freight costs and convenient engineering and repair facilities for a growing, modern line of equipment are afforded operators in the Gulf and off-shore areas by Delta's three-way set-up . . .

The main plant, one of the largest and most modern in the entire South and Southwest, is situated at Baton Rouge. Additional stocking points are maintained at Westwego, just across the Mississippi River from New Orleans, and at Lafayette, Louisiana. From these, deliveries are made promptly to Intracoastal Waterway ports . . .

Operators are finding that Delta's new-type, spherical separators, heaters, treaters, tanks, bulk storage plants, three-phase separators, low temperature extraction units, conveyors and equipment specially designed for offshore production and for dehydration are not only engineered to meet today's exacting requirements, but thorough field testing of each item has also demonstrated the limitations. Research continues to improve performance and adaptation to tomorrow's needs. For real service today—and tomorrow—call DELTA!

Write, wire or call for further details

DELTA TANK MANUFACTURING CO. INC.

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EXPORT OFFICE: INTERNATIONAL TRADE MART, NEW ORLEANS, LA.

MANUFACTURERS OF PRESSURE VESSELS AND OIL FIELD EQUIPMENT

circular contains complete descriptive data and dimension and application tables. **For more information write or call: Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.**

●

Material Handling and Transporting Techniques in a Petroleum Refinery. Field Report No. 77 is a case history of savings accomplished in Union Oil Co.'s refinery at Wilmington, Calif. Shown working in the plant are straddle trucks and lift trucks. **For more information write or call: Hyster Co., P. O. Box 4318, Portland 8, Ore.**

●

Fives-Lille and the Petroleum Industry. This 20-page brochure illustrates the production facilities and many of the refinery installations handled by this French fabricator. Among the products illustrated are towers, bubble trays, pressure vessels, heat exchangers, furnaces, boilers, turbines, and distillation units. Some of the plant photographs were made at the Esso-Standard Port Jerome refinery, the Martigues refinery, Shell's plants at Berre, Petit Couronne, and Pauillac, the Dunkirk refinery, and the Donges refinery. **For more information write or call: Compagnie de Fives-Lille. 7, Rue Montalivet, Paris 8emme., France.**

●

Industrial Waste Treatment. A new process Data Sheet 700(2) outlines latest developments for control of pH and redox in industrial waste-treatment processes. The sheet includes a discussion of controllability factors in waste processes that influence automatic measurement and control of pH. With it is provided a pH controllability analysis questionnaire. This may be completed and returned for recommendations of control methods and equipment. **For more information write or call: Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa.**

●

How to Reduce Corrosion-Protection Costs. How to get greater coverage from protective coating at lower costs in safeguarding pipe, pipe joints, fittings, and couplings is described in this new brochure. The brochure covers the complete story on Tapecoat-X, a new coal-tar coating in tape form which is made with an extra thickness of coal tar to provide double-wrap protection from single-wrap application. Included in the booklet is a table of coverage which shows how the new product goes farther and reduces costs on time, labor, and material. **For more information write or call: Tapecoat Co., 1523 Lyons Street, Evanston, Ill.**

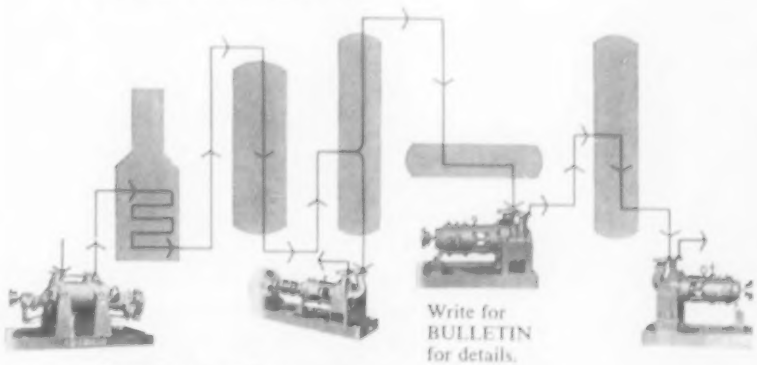
PACIFIC®

The name to remember when your problem is to start the charge stock and to keep it and its fractions moving without interruption on their guided tour through your process unit.

PACIFIC PROCESS PUMPS INSURE MORE SERVICE FOR YOU AND LESS SERVICING BY YOU

because

1. ***Design proportions are not limited*** to "just enough."
Extra heavy metal sections, identical bolting for glands and seal plates are combined with selected materials of construction to provide that "extra margin" needed to extend use life in corrosive-erosive services.
2. ***Guided inlet flow*** reduces prerotation and friction losses ... insures minimum required NPSH.
3. ***They are balanced—dynamically—radially—axially—eliminates—*** vibration that would cause damage to rings ... bushings ... bearings ... packing or mechanical shaft seals ... excessive radial and thrust loads on bearings.
Increases —availability for profitable operation.
Decreases —down time for maintenance.
4. ***Positive lubrication of bearings*** —oil rings pump oil up into bearing cap from where it must flow through—not around —the bearings back into the oil reservoir—contributes to trouble free operation ... longer bearing life ... low maintenance.
5. ***Labyrinth seal*** in each bearing cap ... no contact between shaft and seal ... keeps oil in and dirt out of bearings—prevents contamination of lube oil—contributes to trouble free operation—low maintenance.



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Offices in all Principal Cities

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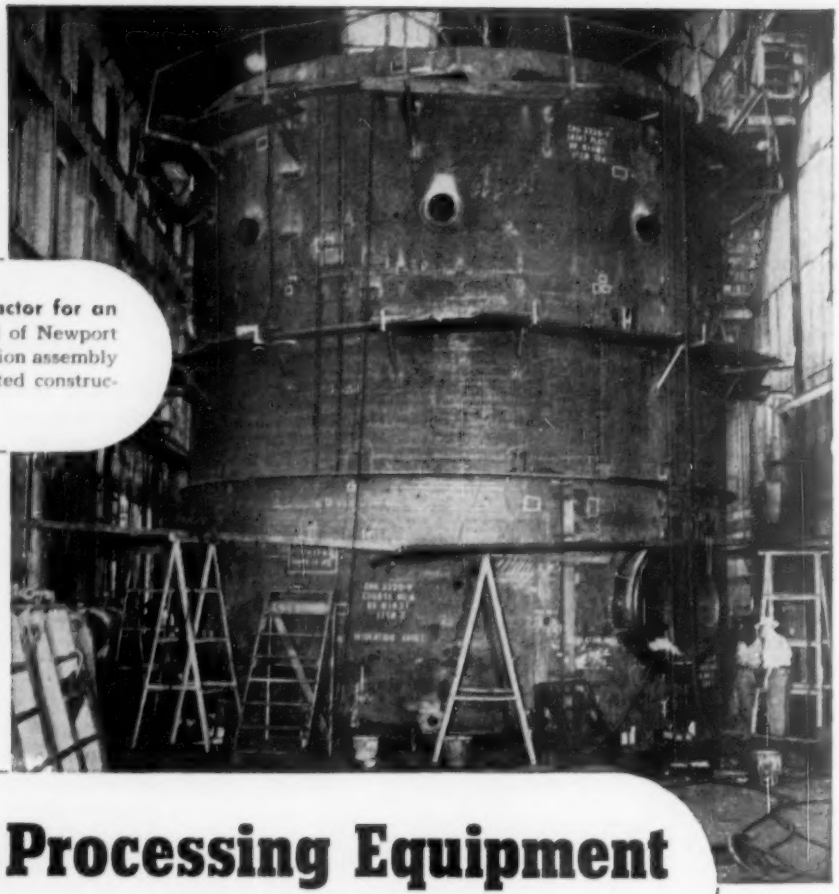


Course number four of a reactor for an overseas oil refinery. Typical of Newport News plant methods, the precision assembly of this unit in the shop expedited construction of the reactor in the field.

Petroleum Processing Equipment

...Built by Specialists in Metal Fabrication

Careful attention to detail characterizes the work of Newport News craftsmen...

They've fabricated millions of tons of steel including corrosion-resistant alloy, clad and other special steels for many diverse industries.

Newport News handles the job exactly as you want it done, for maximum results per dollar invested.

Specialized production techniques, advanced plant methods and a complete range of facilities along with many special purpose machines contribute to the excellence of Newport News fabrication.

Let us bid on equipment for your present or future projects. Learn how Newport News can help you...send for our booklet entitled "Facilities and Products." It's yours for the asking.

Newport News Shipbuilding and Dry Dock Company

Newport News, Virginia

EQUIPMENT MEN . . . in the News

Baroid Expands Sales Group In Texas Gulf Coast Area

G. G. BLOXSOM

Baroid Division, National Lead Co., announces an expanded sales and service organization in its Texas Gulf Coast area. The Gulf Coast of Texas has been designated as a separate area with headquarters in Houston. Alan C. Cramer has been appointed manager of the Texas Gulf Coast area.

George G. Bloxsom will continue as area sales manager.

A. B. McDANIEL

G. G. ALLEN

A. B. McDaniel has been appointed sales representative of the Texas Gulf Coast area. T. A. Bergin remains sales representative of the Texas Gulf Coast area and headquarters in Houston.

J. M. HUMBLE

W. C. KELLOGG

C. W. Felker and J. M. Humble are also sales representatives in the Texas Gulf Coast area.

G. G. Allen has been appointed area engineer. Allen has been Gulf Coast division field-service engineer and has over 7 years' drilling-mud experience with Baroid. He will be available for consultation on mud and drilling problems in the area.

The Texas Gulf area is divided into five districts. The following district superintendents direct and aid service-engineering and related activities of the districts. W. C. Kellogg is superintendent of South Texas with headquarters in Corpus Christi. C. E. Carroll is superintendent of South Central Texas with headquarters in Beeville. J. B. Head is superintendent of the Houston district with headquarters at Houston. Jack Brooks is superintendent of the Beaumont-Liberty area, with headquarters in Beaumont, and W. B. Boutwell, Jr., is superintendent of the East Texas area, with headquarters at Tyler.

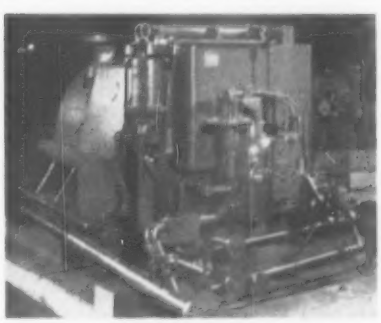
Cramer has been with Baroid for over 20 years, working with drilling operators on mud problems in the Mid-Continent and the Gulf Coast. Prior to his appointment as manager of the Texas Gulf Coast area, Cramer was assistant manager of the Gulf Coast division.

Horenburger Named Sales Manager By Aetna

HORENBURGER

Appointment of William E. Horenburger as sales manager of Aetna Ball & Roller Bearing Co., a division of Parkersburg-Aetna Corp., was announced recently by I. J. Rozner, executive vice president. Horenburger was formerly associated with Thomson Industries, Inc., of Manhasset, N. Y. Cowan has recently been engaged in consulting projects in plant layouts.

G-E Turbine Goes to Midwestern Refinery



Shown ready for shipment to a large midwestern refinery is a General Electric Co. DRV high-speed mechanical-drive turbine. The unit is rated 1,910 hp. at a speed of 9,150 r.p.m. It will be used to drive an Ingersoll-Rand centrifugal compressor. Built at the G-E small turbine and supercharger plant, units of this type are now being designed to operate at speeds in excess of 10,000 r.p.m. to keep pace with the growing demand for high-speed turbines in one of the country's most highly mechanized industries.

Ideco Makes K. D. Boyd Manager, Technical Service

K. D. BOYD

Appointment of King D. Boyd as manager of technical service, a new key position at Ideco headquarters in Dallas, has been announced by George W. (Jack) Walton, executive vice president of Ideco, one of the Dresser Industries.

Boyd has been closely associated in the recent development of diesel-electric power and, for the past 7 years, was petroleum sales manager for Stewart & Stevenson, oil-field-engine distributors of Houston.

His wide field experience includes several years with a manufacturer of drilling bits, design engineering with Army Ordnance, and sales promotion for General Motors oil-field-engine division.

National Tube Division Advances Kenneth Lieber

K. LIEBER

Kenneth Lieber has been appointed assistant vice president of sales of United States Steel's National Tube Division, according to H. J. Wallace, vice president. Lieber began his business career in the engineering department of Pennsylvania Railroad in 1937.

In 1945 he joined Consolidated Western Steel, which is now a division of United States Steel, as a contracting engineer and, since January 1, 1955, has been vice president in charge of engineering. He has served Consolidated in Orange, Tex., Washington., and Los Angeles, in various capacities, including manager of pipeline sales and assistant vice president of sales.

Happy Transfers Ritter to Rocky Mountain District

John W. Ritter, chief cooling-division sales engineer for Happy Co. in Tulsa, has been transferred to Denver to head the firm's new Rocky Mountain district offices there, according to Leo C. King, president.

National Supply Opens Store at Sterling, Colo.

National Supply Co. has opened a new oil-well equipment and supply store at Sterling, Colo., to serve drillers and producers in Logan, Sedgwick, and Phillips counties, in the northeastern corner of Colorado.

J. L. Grant has been appointed store manager. The Sterling store is under the supervision of Luther M. Miller, district manager, Denver.

Sterling is located about 125 miles northeast of Denver. National Supply has two other stores in this area, one at Fort Morgan, Colo., and the other at Sidney, Neb.

Crane Co. Makes Hunter District Manager

R. G. Hunter, manager of the Tulsa branch of Crane Co. since 1946, has been appointed district manager with headquarters at Dallas.

He succeeds J. A. McMurry, who has been named director of Crane branches with headquarters at Chicago.

Hunter has been associated with Crane since 1925 when he joined the company at its Springfield, Ill., branch.

FOR MAXIMUM STRENGTH and SERVICE

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Prosser-Type

Swivel Rope Sockets

. . . first choice of drillers everywhere

Completely Heat-Treated for uniform toughness and hardness inside and out, SPANG Prosser-Type Rope Sockets give longer service, greater footage at lower cost.

The Rope Swivel and the internal Swivel Seat are made of a special hard steel, heat-treated for maximum wearing qualities.

Precision machining and inherent, high steel strength, combine to provide an exceptionally strong joint for long, trouble-free service.

Special attention is given to finishing the inside bore to assure perfect cable set.

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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

Weco Appoints Thrasher to North Louisiana Area

J. R. THRASHER

J. R. (Jim) Thrasher has been appointed sales representative in North Louisiana for Weil Equipment Manufacturing Corp., according to announcement by John Gates, sales manager. Thrasher will make headquarters in Shreveport. He has had 4 years' experience with Gulf Oil Co., in the warehousing and purchasing departments, was sales and service representative in South Louisiana for Reed Roller Bit Co., and more recently represented National Tank Co. in East Texas.

Core Lab Names Shearin as Senior Petroleum Engineer

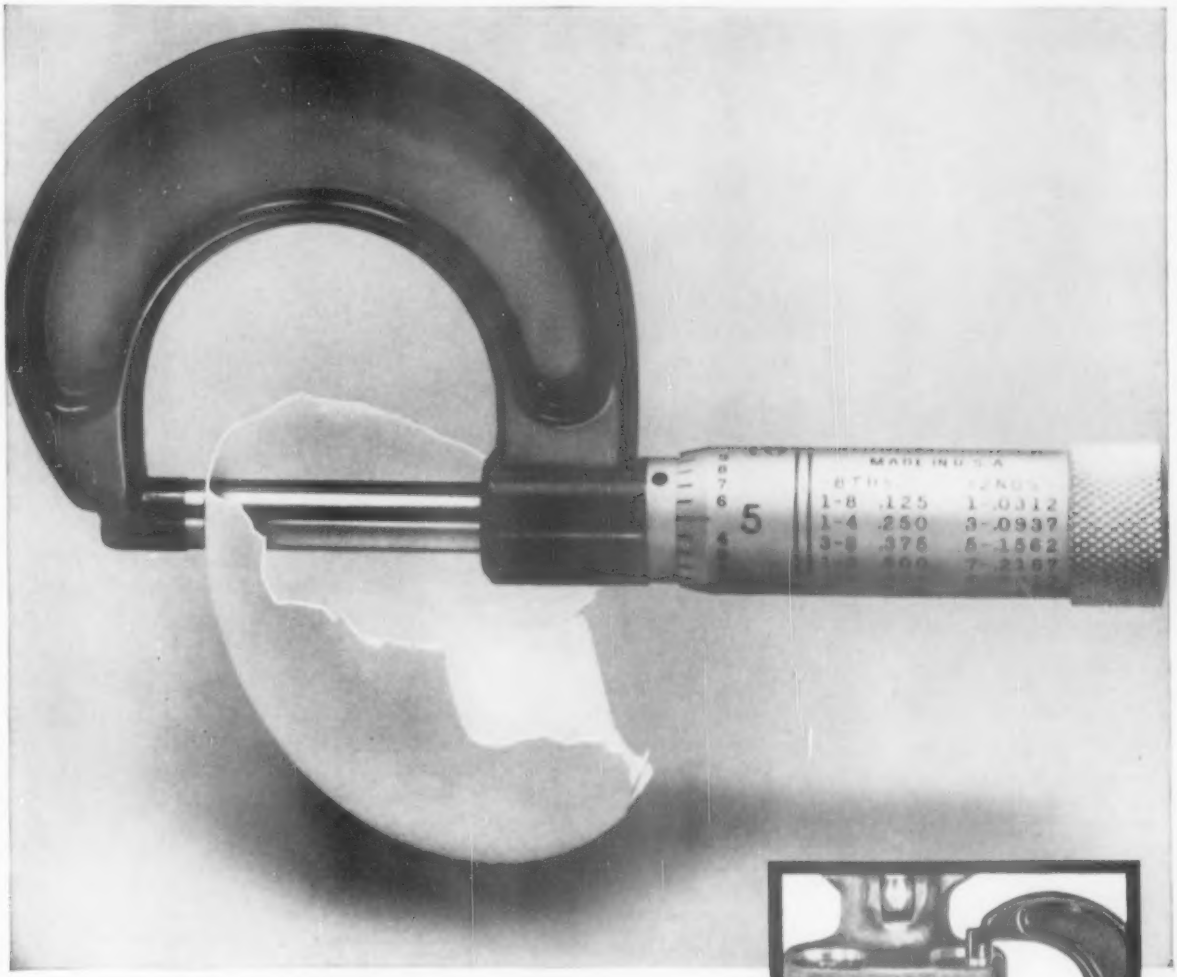
Core Laboratories, Inc., Dallas, has announced the addition of H. M. Shearin as a senior petroleum engineer in the firm's reservoir-engineering and consulting department. A chemical-engineering graduate in 1948, Shearin was employed immediately prior to his new Core Lab position by Humble Oil & Refining Co., Houston. Previously he had received field training with Gravity Meter Exploration Co., and U. S. Engineers. His activities with Humble included formation-evaluation work on a number of the company's oil and gas fields and studies of participation factors in unitization projects.

Oilwell Names Managers at Worland, Mount Carmel

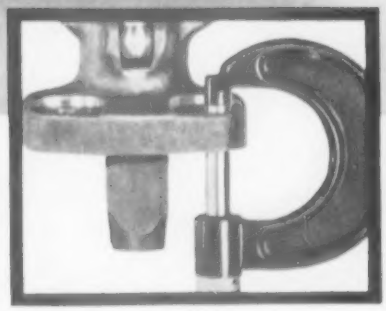
Appointment of Harley A. Harris as store manager of the Worland, Wyo., store, was announced by R. L. Armstrong, Rocky Mountain area manager, and the appointment of Arthur F. Fiensy as store manager at Mount Carmel, Ill., was announced by C. H. Maynard, eastern area manager, for U. S. Steel's Oil Well Supply Division.

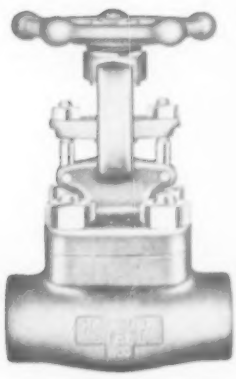
Harris joined the Oilwell organization in 1952 as a storeman at Powell, Wyo. Later that year he was transferred to Worland and served there in the capacity of a storeman until his present appointment.

Fiensy joined Oilwell in 1950 as a



STRENGTH
that matches the purpose





THE BONNET FLANGES on the Type 950 Hancock Steel Gate Valve combine compactness with rugged strength *where strength is needed most.* Flange thickness and bolting provide sturdiness that can withstand more than ten times the rated pressure of the valve. Butting of the flange faces eliminates every possibility of bending and distortion.

In revalving old, or installing new process and power piping systems, the enduring strength of Type 950 Hancock Steel Gate Valves always proves there is no substitute for the economy of quality. Get complete facts. Phone your Industrial Supply Distributor today.

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A product of

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AT LAST . . . .
A STANDARD PIPE ANCHOR

Bos-co
UNIVERSAL
PIPE ANCHOR

- Less expensive than special strap anchors.
- Handier; no more waiting to have anchors made.
- Pipes of same size can be stacked and valuable space saved.
- Adaptable for many uses.

Available At Your Supply Store

Bos-co
EQUIP'T ENG'R'G & MF'G.
526 South Boulder Ave., Tulsa, Oklahoma

storeman at Mount Carmel. In 1951 he was appointed field representative at this location and served in this capacity until his present appointment.

Union Tank, Supply Names Williams as Sales Manager

C. R. WILLIAMS

Charles R. Williams has been appointed sales manager of Union Tank & Supply Co. at Houston, and will direct the company-wide sales activities. In addition, he will continue his present function as regional manager of the West Texas-New Mexico operation of the company.

Williams has been associated with Union Tank & Supply for 9 years, and has held positions as sales representative and branch manager in the Alice, Tex., area, and as regional manager in Dallas.

H. L. Poole, vice president of Union Tank & Supply, will concentrate his efforts on the supervision of sales activity in Houston, Louisiana, and South Texas, and will function as regional manager for these areas.

L. O. F. Glass Fibers Boosts Simpson and Heyman

Robert E. Simpson has been appointed sales manager of the Southwest region with headquarters at Houston, and Robert N. Heyman was made district manager of the Dallas area for L. O. F. Glass Fibers Co., it has been announced by J. M. Jones, vice president and director of sales.

Simpson was formerly with Glass Fibers, Inc., where he held the positions of Atlantic regional sales manager, Atlantic branch manager, and Detroit sales representative.

Heyman was with Glass Fibers, Inc., for 2½ years before it merged with L. O. F. Glass Fibers on March 1, 1955. Two of those years were spent as southwestern sales representative, with headquarters in Dallas.

Ted Sandelius to Direct Tube-Kote Custom Service

TED SANDELIUS

Ted Sandelius has been appointed sales manager to direct the expanded custom-coating department for Tube-Kote, Inc., Lynn Edgar, sales manager of the Houston plastics company, recently announced. Previously Sandelius was representative with Standard Brass & Manufacturing Co. serving the Gulf Coast. As director of Tube-Kote's custom-coating department, he will serve the same area and provide industries with Tube-Kote's TK-2 plastic, Teflon plastics, and other Tube-Kote plastic linings.

The custom-coating department gives oil-field equipment manufacturers and other industries in the Gulf Coast a nearby heaquarters for plastic lining of such diversified items as petrochemical equipment, storing and mixing tanks,

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IS A TOOL
FOR OILMEN
We can help you put it to productive use.
★ We're oil-minded,
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★ Interested in loans of any size.
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MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Licenses under U. S. patents Nos. 2,390,560, 2,667,559, 2,678,987 and 2,713,106 relating to various aspects of automatic girth seam welding of large steel storage tanks are available on reasonable terms. If interested write to

CHICAGO BRIDGE & IRON COMPANY
1305 West 105th Street
Chicago 43, Illinois

DRY DISTILLATION IS FEATURE OF SIGNAL'S TIOGA PLANT DESIGNED AND ENGINEERED BY PRITCHARD!

Signal Oil and Gas Company's new Tioga, North Dakota, natural gasoline plant features dry distillation, with no steam used in the gasoline recovery process.

The entire plant was designed and engineered by Pritchard for extreme cold weather operation, with temperatures —40° F or below.

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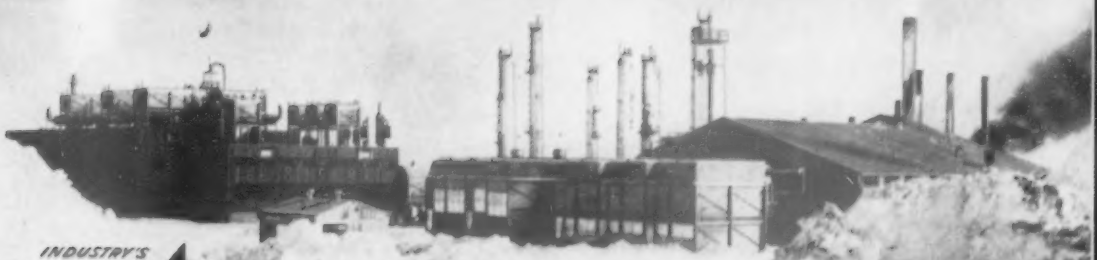

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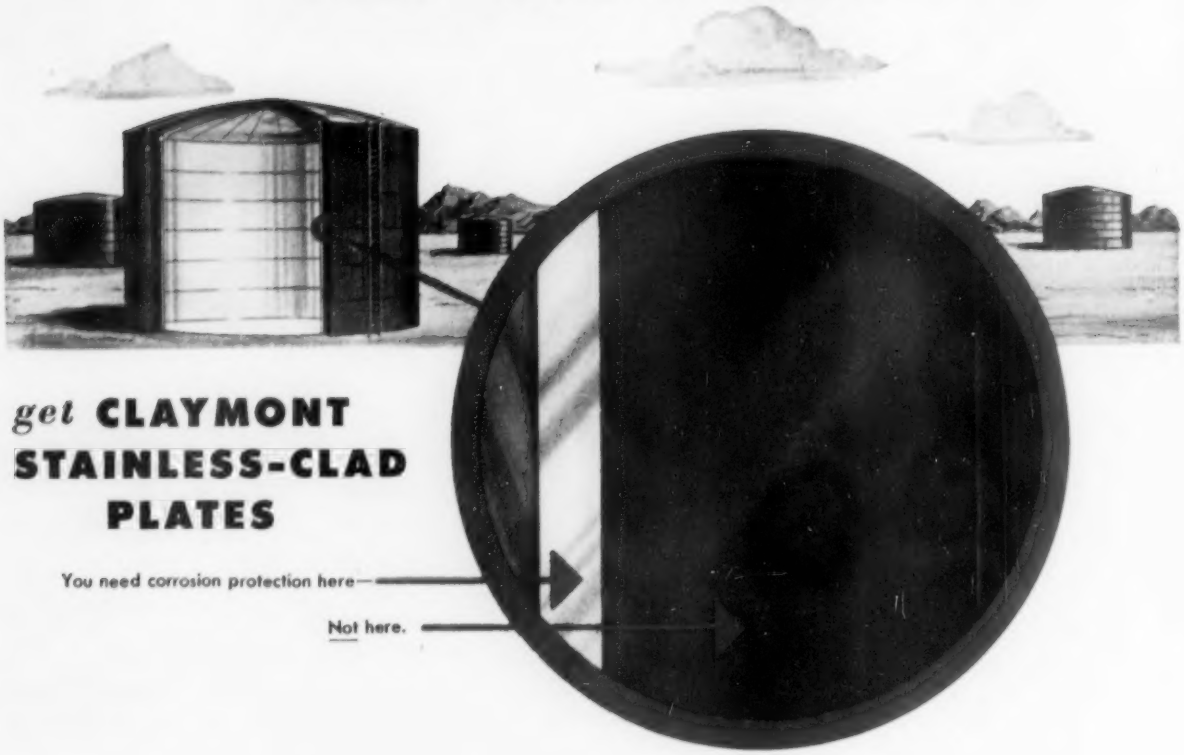

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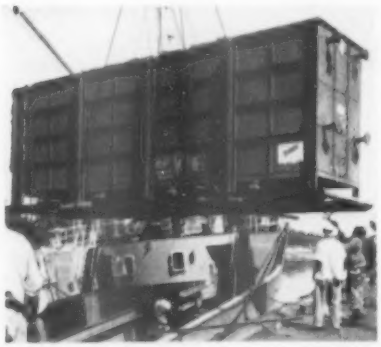
Macco Forms Distributor In Louisiana-Mississippi

Macco Oil Tool Co., Houston, manufacturer of gas-lift and associated equipment, has announced the formation of a new distributorship for South Louisiana and Mississippi. The name of the company will be Macco Gas Lift Of The Mississippi Delta, Partners in the division are William B. (Ben) Adair and Purvis J. Thrash.

Adair started with Macco in February 1953 as sales engineer, and has been chief engineer of the firm for a year. As such, Adair acted as liaison between the home office in Houston and branch offices in Texas, Louisiana, New Mexico, Mississippi, and California, and assisted in engineering problems. He also was sales manager for the Houston division of Macco. Prior to his employment with Macco, Adair was a petroleum engineer with Associated Engineers of Houston, an oilfield service and consulting firm.

Thrash has been a distributor for Macco in Louisiana for the past 2 years. Prior to the forming of the partnership, Thrash was distributor in the South Louisiana division, called Macco Sales & Service of Houma, for 1 year, and was a distributor in Lafayette the first year. Thrash was formerly employed by Pan American Pipe Lines as a petroleum engineer, working the West Texas and East Texas divisions.

Born Upflo Heaters Go to Eastern Venezuela Plant



Work has started on the construction of a new refinery in eastern Venezuela, and two Born Engineering Co. Upflo heaters are being shipped overseas without crating or weatherproofing. Ruggedly built and easily sealed against the elements, the 45-ton units were stored in the hold of the freighter without extra protection. The two heaters will be used in the refinery, scheduled to provide high-grade products for Venezuelan markets.

Toledo Names Hartsing Field Sales Manager

Announcement has been made of the appointment of C. E. Hartsing as manager of field sales, by Toledo Pipe Threading Machine Co. of Toledo.

A member of Toledo's sales staff for many years, he served as the firm's western sales manager prior to his present appointment. In his new post he will be in charge of Toledo's enlarged sales force covering the United States and Canada.

Granberry Made District Manager by Core Lab

Core Laboratories, Inc., has announced the appointment of R. J. Granberry as district manager of the company's upper Gulf Coast operations from offices and lab facilities located in Houston, and promotion of R. C. Wilshusen, Oklahoma City, to district manager in the Corpus Christi area.

GRANBERRY

WILSHUSEN

Granberry is a member of Core Lab's board of directors and has served as district manager in Corpus Christi for the past 8 years. Well known in the petroleum industry for work in core analysis throughout the Gulf Coast and South Texas areas, his new assignment follows the recent resignation of Ben A. Elmdahl, former Houston district manager.

Employed by Core Lab immediately following his graduation, Wilshusen has served as assistant district engineer in the Oklahoma-Kansas area since 1951. He assumed direction of Core Lab's lower Gulf Coast and South Texas operations on August 15.

Squier Announces Start Of New Facilities

John P. Squier Co., in its tenth year of gas measurement service to oil and gas operators, has announced the construction of a new building which will triple present facilities.

The new headquarters will be of fireproof steel and masonry construction, and will afford a large shop area for overhaul and reconditioning of orifice meters.

John P. Squier Co., founded in 1945, specializes in orifice-meter chart integration and gas-measurement calculations. Recently a gas-testing and field-meter maintenance service has been added.

Totco Announces Changes In Field Service Branch

H. H. (Pete) Peters, president of Technical Oil Tool Corp., has announced a number of recent changes in the field-service organization.

In the Gulf Coast area, Maurice Webb has been transferred from Houma, La., to Lafayette to replace Don Gibbs. Bobby L. Howard has taken over Webb's former duties at Houma and Harvey, La. Both Howard and Webb operate under the supervision of Ray O'Rear, Totco Gulf Coast division manager.

In the Oklahoma-Kansas area, S. W. Stafford will be located at Pratt, Kans. Stafford, previously employed by a drilling contractor, will service Ellinwood, Liberal, Pratt, and Russell, Kans.

R. G. (Bob) Willson will replace Bob Scott. Willson will be stationed at Farmington, N. M.

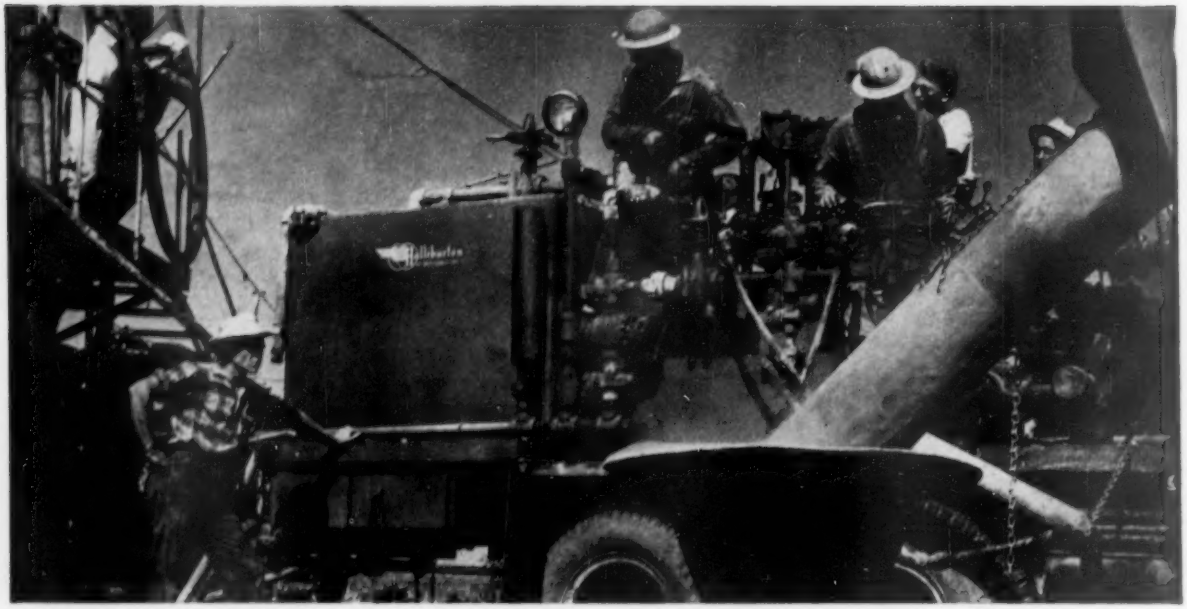
In California, William R. Webb, at Bakersfield, will cover Avenal, Bakersfield, Rio Vista, and Taft.

Bonn Becomes Official of Rosson Richards Engineering

Lyle E. Bonn has become vice president and chief engineer of Rosson Richards Engineering Co., Houston. Bonn recently left Creole Petroleum Corp. He has served as engineer in the company's Lake Maracaibo operations.

Sooner Announces New Store at Hays, Kans.

Sooner Pipe & Supply Corp., Tulsa, has announced the opening of a new store at Hays, Kans. The new store, completely remodeled to house a wide array of equipment, will be managed by Clarence Foos. The store will handle heavy oil-field equipment including pumps, engines, motors, oil-field wire, and all kinds of drilling equipment.



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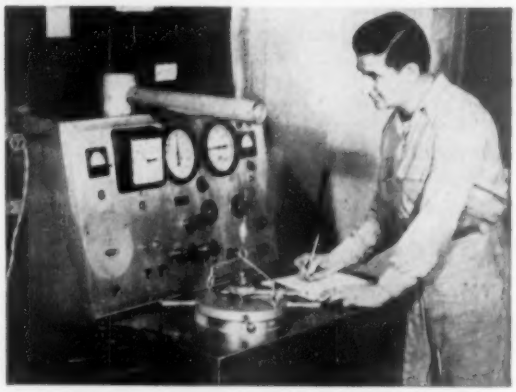
*"UNAFLO" is the registered trade-mark of the retarded oil-well cement manufactured by Universal Atlas Cement Company



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EXPLORATION

Youth—in The Hands of The Receivers

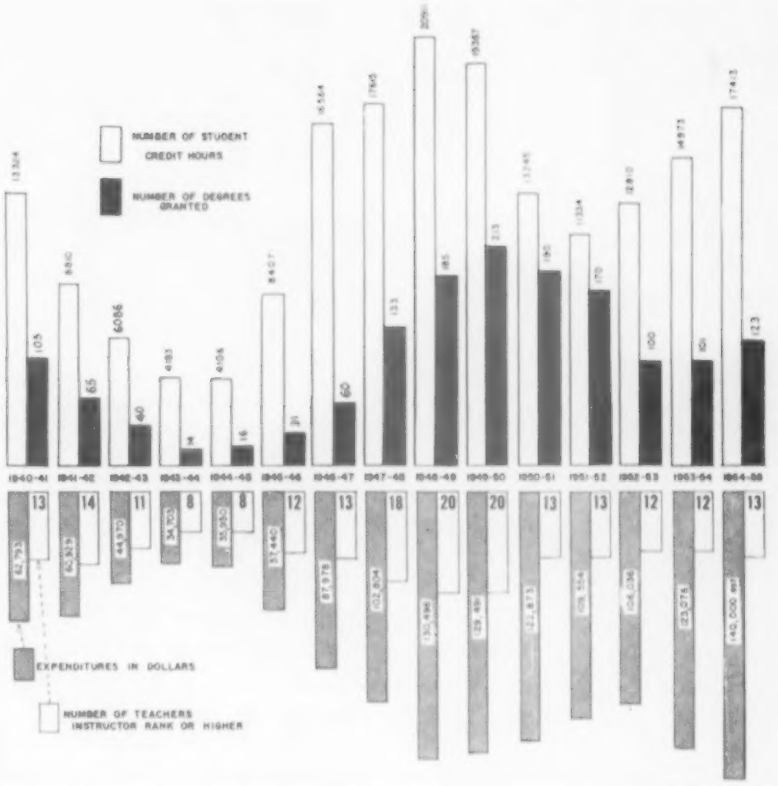
by Frank J. Gardner

"GOVERNMENT Files Suit Against Geologists."

"C.I.O. Set to Organize Professional Men in Oil Industry."

"College Enrollments to Dwarf Teaching Staffs."

Do you like to read headlines like that? They've all appeared within the past month. All three are red flags waved before the A.A.P.G., the S.E.G., and every other scientific society in this country. Ethics, professional pride, and alumni concern can avoid geological delinquency, and this is no time to stand around twisting mental handkerchiefs in the hope that the problem will solve itself. It won't.



Tragic teacher shortages can only produce poorly prepared geology graduates. Here is the situation at University of Texas.

Ethics . . . Since 1952, when A.A.P.G. President Morgan Davis pushed his campaign for greater stress on professional ethics, that association has carried the banner high, but obviously not high enough.

Today, a new evil arises with the advent of the uranium rush; the September issue of the A.G.I. Newsletter cites the ". . . indiscriminate movement of geologists from Federal bureaus to private companies." The suit filed by the U. S. dramatizes a breach of ethics, and members of the A.A.P.G. have a right to expect that the matter will be followed through thoroughly.

Professional pride . . . As for the unions, geologists are prone to scoff. "A few draftsmen," they say, "and perhaps the borderline semigeologist, but no man with professional pride would consider such an alliance." But the unions are more candid. They publicly state their objectives as ". . . the upper level professional and technical employes in the oil industry, aimed at physicists, chemists, engineers, and geologists . . ."

Unions are fine for those who feel the need. But the need seems a little remote when the organizers point out even more candidly that "There's no question but that the professional and technical men in the petroleum field have one of the highest pay scales . . . in the country." It makes one wary of the true objectives of this campaign, whose target date, incidentally, is set for June 1956.

And educational background . . . What is **our** target date? Wouldn't September 1955 be a suitable one? Colleges and universities are opening their gates to a freshman flood—and the really spectacular increases in enrollment are still 3 years away. Look at the chart on this page. It appears in the current issue of the newsletter published by the geology department at The University of Texas. Here is a school that provides 1 out of every 12 geology graduates in the U. S.—a school with more geology students than any other in the world. This month, it expects 2,600 enrollees in geology. How many teachers? Fourteen. That's 180 students per teacher. Geology is now among the five top professions chosen by freshmen, yet less money is spent per credit hour in geology than in speech!

Will avert moral bankruptcy . . . Whatever the school, whatever the subject, a sterile college life that awards a student only 13 minutes per week of his teacher's time will never produce graduates with ethics, professional pride, or a sound educational background. It is up to all concerned to try to improve the situation or we shall sell that student right into the hands of the moral receivers, ethically bankrupt.

What can we as individuals do?

- As **faculty,** we can: ask more lab and classroom space; limit classes to grade minima; request budget increases to hire more teachers at better salaries.
- As **alumni,** we can: arouse legislation for better financial backing to higher education; arouse the industry to help generously where the state cannot; contribute freely to geological foundations now extant at many schools; establish trust funds, scholarships, and loan funds.
- As **A.A.P.G.,** we can: give more of our time to that organization's activities; press for stricter enforcement of its code of ethics; serve on its committees and stress its importance to younger geologists.
- As **industry,** we can: establish scholarships, endowments, and teaching fellowships; lend teachers and research facilities; contribute toward research funds, influence legislation and public opinion; employ summer students and faculty; refrain from robbing faculties of men more fitted for teaching than for trade; and hire a man for his brain and not for his briefcase.

Fig. 1—Navarro production at 200-5,000 ft. covers a wide area in Southwest Texas.

Fig. 2—Stratigraphic cross-section shows the various producing sands in the Navarro. High connate-water content probably accounts for the low resistivity curves through sands.

How Fracturing Makes Navarro Sands Pay

. . . a quick review of the geology of these Southwest Texas shallow sands and the specific production techniques that are making them economic

by J. M. Montgomery

IN digging footings for buildings in San Antonio, quite often oil seeps are found in the Navarro formation with enough gas to make it dangerous for the workers. To the west and south of Hondo, there are places where the Navarro is very shallow and could be mined, but not commercially at this time. South of San Antonio a few miles, 215-ft. wells that will make about 1 to 2 bbl. per day can be drilled with cable tools. These are not new occurrences. It has been a known fact for 30 years, but only with the development of fracturing has the Navarro been turned into a prolific producing area. It extends from 20 to 30 miles east to 100 miles southwest of San Antonio.

The Navarro formation outcrops in San Antonio and dips to the south for about 50 miles where it eventually shales out paralleling the Balcones fault. This sand series is unique in several respects. First it is dissolved-gas or gas-expansion production, with no other means of drive. Some operators call the Navarro the "Olmos." Shell Oil Co. has given each sand a respective letter—A, B, C, D-1, D-2, D-3, etc.

The "A" sand, or the upper sand, produces from 5,000 ft. at Charlotte, Tex. It is the one sand in the series that produces naturally. The "A" sand is the cleanest sand, and has a slightly larger grain size. It has been possible to produce it without any fracturing treatments.

Author is with Halliburton Oil Well Cementing Co., San Antonio.

After the field had dissipated quite a bit of its gas in place, fracturing showed no appreciable results. Since the top sands are eroded to the north, the "A" sand is found only in the extreme south end of the area. It is downdip and produces from about 4,950 to 5,100 ft.

The initial production of these wells varied from 75 to 100 bbl. per day and declined rapidly to about 25 bbl. per day. This "A" sand has a porosity of approximately 25 per cent and varies from 30 to 40 md. permeability. It contains 35 per cent connate water which tests 44,000 p.p.m. salt. There is from 10 to 30 ft. of effective sand producing in this most southern area.

Big Foot production . . . The "B" sand, or the Big Foot sand, was the first Navarro sand fractured. It was a sand that C. C. Dauchy encountered on a farmout from Shell Oil Co. on the Nowlin lease in Big Foot. He had drilled the 1 Thompson, an offset location, which was producing naturally about 14 bbl. per day. But Shell engineers, realizing that the drainage area must be increased in the "B" sand to make it commercially productive, made the stipulation in the farmout agreement that Dauchy must fracture one well, underream another, and drill five wells on the Nowlin lease.

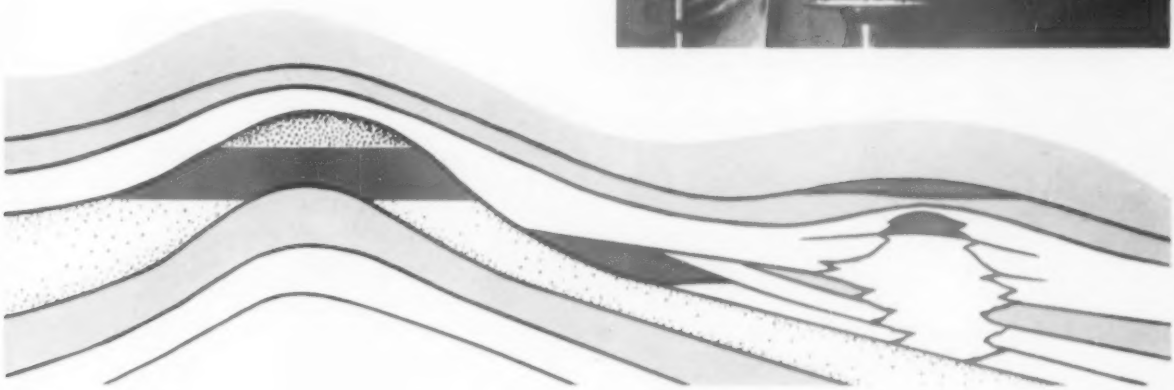
Shell was correct in the assumption, even though the first fracturing job did not show an improvement. Later jobs, using emulsified acid, opened the Big Foot area where Shell now has 268 wells. The Texas Co., Lewis Oil Co., Midstates Oil Co. and many others have considerable production in the near vicinity.

The "B" sand, at 3,200 ft., has four to six stringers separated by shale. However, it is not a shale-laminated sand, but a sand with shale and lime inclusions. Gross sand sections are about 30 or 40 ft., but average only 11.6 ft. of effective sand in Big Foot field. The "B" sand has 27 per cent porosity and Shell gives it an average of 3.6 md. Other companies, however, report it to be from 10 to 15. It has 11 per cent acid solubility and has a high connate-water content range from 60 to 70 per cent. This water contains about 30,000 p.p.m. salt. It is a fine-grained sand with approximately 10 per cent bentonite and other clays dispersed through it. (From this general description the possibility of producing such a field might seem negligible. However, as fracturing developed, Big Foot field and outlying fields in the Navarro have developed.)

Completion practice . . . Shell fractured its wells originally with 3,000 gal. of acid emulsion and 9,000 lb. of sand. The treatments were then increased to 3,000 gal. of acid emulsion and 12,000 lb. of sand, followed by 4,000 gal. of acid emulsion and 16,000 lb. of sand.

No. 3 of a Series

RECONNAISSANCE BY GRAVITY



PROSPECTING PROCEDURES

In the search for petroleum, reconnaissance gravity surveys are economical for examining large areas prior to conducting more detailed geophysical and geological studies.

One such method is applicable where the features of interest are known to have high density contrasts. For this method the determination of elevations is modified and the station spacings are increased. Later, the interesting areas of the reconnaissance survey can be filled in and detailed by standard elevation survey procedures.

For areas of small density contrasts the normal elevation accuracy is maintained with standard survey techniques, but the station spacings are increased.

For an average region in the continental U.S.A., a minimum of four townships can be mapped per month by these reconnaissance techniques.

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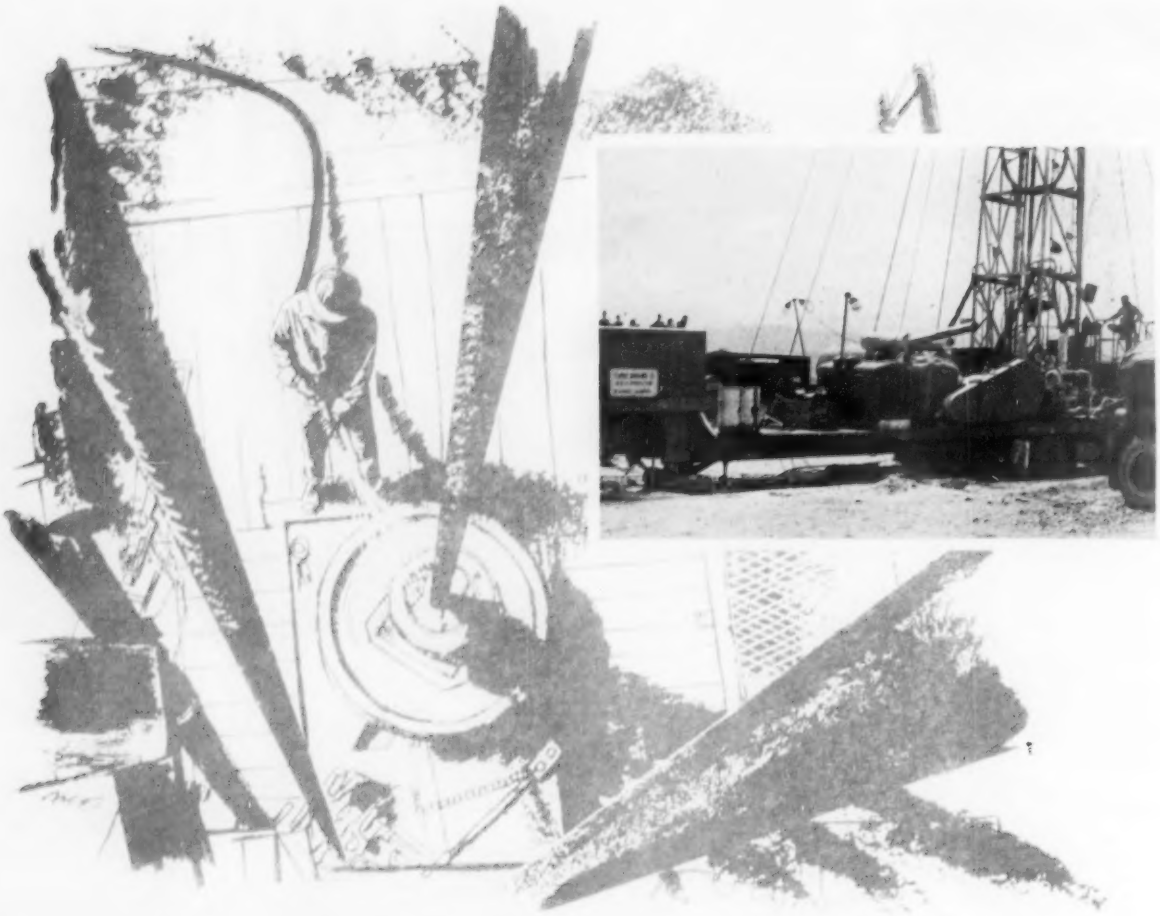

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Smoother than Steam

-Pulls 5000-Foot String in High

Comet Drilling Company Vice-President, Paul Scott, reports his firm's TORQMATIC-equipped Franks Giant Clipper makes a 5000-foot round trip in 3-3½ hours — "good time for a short rig," according to Mr. Scott.

He also reports he's drilling faster, spending less for rig maintenance, with an Allison TORQMATIC DRIVE providing rig power "smoother than steam."

The TORQMATIC Converter-Transmission team speeds round trips because the driller can come off bottom with a 5000-foot string, then quick-shift to high gear at full throttle with finger-tip hydraulic control for faster pipe-pulling.

And the TORQMATIC Converter reduces rig maintenance—takes it easy on the drill pipe — because it cushions and absorbs shock loads instead of transmitting them to other parts of the rig.

Allison's TORQMATIC DRIVE does two jobs in the Franks Giant Clipper — drives the draw works *and* propels the unit over the road. It means faster road trips—faster round trips. And its smooth power transmission gets the rig on location easier, even over the toughest terrain.

You can get an Allison TORQMATIC DRIVE in drilling, servicing and fracturing units made by most leading manufacturers. Ask your engine distributor, equipment manufacturer or dealer about Allison TORQMATIC power transmission for your units, or write for more information to Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

GM TORQMATIC

Allison

TORQMATIC DRIVES

They then used 4,000 gal. of acid emulsion and 20,000 lb. of sand, but reverted to 3,000 gal. of acid emulsion and 15,000 lb. of sand due to the very little difference in final production. Experience showed that it was more economical to run this size job.

One interesting thing Shell discovered was that it apparently made very little difference how much flush oil preceded or followed the fracturing material. They tried jobs using 30,000 lb. of sand and even tried 60,000 and 62,500 lb. of sand. The latter was the first well using graded sand. There was 20,000 lb. of 40-60 mesh sand, 20,000 lb. of 20-40 mesh sand, 20,000 lb. of 10-20 mesh sand, and 2,500 lb. of 8-12 mesh. These wells held up a little better than the ones that had the regular fracturing treatment, but it is believed there was very little difference in the final results.

It was rumored at one time that when one of these wells was given a big fracturing treatment, the offset well would show an improvement. However, Shell engineers were unable to substantiate any of these reports. The "B" sand also produces in the Kyote, Sutton, Pruitt, North Charlotte, Crown, and the West Big Foot areas.

West Big Foot . . . From the general appearance on a map showing Big Foot field, it would appear that West Big Foot field was an integral part of it. But it is not, for it has been proved that there is a nonpermeable barrier existing between the two fields. There is no faulting indicated, but the permeability dropped to near zero and West Big Foot field produces from the "B" sand and produces only dry gas.

The "B" sand is located below a marker, called the Lituola or "Lit," of the Taylorensis. The "Lit" is a fossiliferous unconformity that is a good reference point for the start of a coring program. The sand is very similar in both fields. (This field has from 16 to 45 ft. of effective sand.)

The normal procedure is to fracture these wells on completion. The first wells were fractured with 4,000 gal. of acid emulsion and 16,000 lb. of sand. However, Lewis Oil Co. has started using 4,000 gal. of oil emulsion and 16,000 lb. of sand with equal results and at a considerable saving in cost.

The wells initially will make from 1 to 1½ M.M.c.f. before fracturing. After fracturing, they will make from 2 to 10 M.M.c.f. upon open-flow potential. The sand is approximately the same depth as in Big Foot field, and is found from 2,950 to 3,250 ft. It has a 27½ per cent average porosity with 43.5 per cent average interstitial water. The reservoir pressure is 1,350 psi. at 130° F. It has been found that if the reservoir could be reduced to 100 psi. by withdrawals under volumetric control, the total recovery would be 214 billion feet. This field has a total effective area of 18,840 acres and a reserve volume of 369,630 acre-feet.

Kyote field . . . This is an east and north extension of Big Foot field and has approximately 85 wells. The "B" sand is encountered here at 3,450 to 3,600 ft. and the normal fracturing procedure at this time is to use 4,000 gal. of emulsified crude and 15,000 lb. of sand.

What makes this field unique is that it produces from both the "B" and "D-3" sands. After the fracturing treatment, these wells potential about 65 bbl. flow, and then show a rapid decline to a 12 bbl. per day pumping. This again shows the characteristics of gas-expansion production. In this field the amount of fracturing materials used makes very little difference. But one thing of interest is that in fracturing one well with radioactive sand, the fracturing material went into the best part of the producing zones according to the electric logs on the well.

Horn field . . . Here is a typical producing field from the "A" sand. It is north of Charlotte, Tex., and the first well, the 1 Pruitt, was completed naturally and potentialed 130 bbl. per day through an 8/64-in. choke. The second well drilled in the field, the 3 Pruitt, was fractured on completion with 6,000 gal. of emulsified crude and 18,000 lb. of sand, and potentialed 194 bbl. per day through a similar choke. The Horn, Pruitt, Sutton, Crown, and North Charlotte fields produce on a series of step faults lying between the city of Charlotte and Big Foot field.

It is easy to see that as the Navarro series comes updip, the sand becomes slightly more porous but loses its gas content. Most of the similar fields in the D-3 sand (northward toward San Antonio), no longer produce; it is strictly a drainage situation and the production has declined over the years.

Typical new "D" sand production . . . Bear Creek field is about 8 miles north of Big Foot and probably produces in the D-1 or D-2 sand. In this area the "A" and "B" sands are eroded off, leaving only the "D" sands which usually have two to four stringers separated by calcareous shales.

The formation in this area is more shaly and produces quite a bit of connate water. But, as in the upper sands, there is no water or gas drive. It is strictly a gas-in-solution situation and the sand produces by gas expansion.

The sand has a field porosity of about 30 per cent and has 30 to 40 per cent oil in place. The residual oil, by core analysis, shows an average of 12 per cent. This field is similar to the Taylor-Ina which is farther north, yet produces from the "D-3" sand. There the wells are fractured with 4,000 gal. of emulsion and 20,000 lb. of sand. The wells will make initially from 15 to 20 bbl. per day from about 2,100 ft. But after a few months they drop off and produce 5 or 10 bbl. per day pumping. Engineers' reports on this section reveal that these fields usually have no more than 5 ft. of effective sand.

Taylor sand . . . South of Hondo the Navarro carries considerable oil saturation in what is locally known as the Taylor sand, but is classified as the "D-3." It has a low permeability and the only wells fractured in this area used an emulsified acid. The sand here will disintegrate when water wet, and fracturing resulted in an uncontrollable sand situation.

It has been definitely established that the wells in this bentonitic-sand area should be fractured either with natural crude or a fluid that does not contain water. The gas has been dissipated to a great extent and production has reverted to a drainage proposition. One well, after fracturing from 1,100 ft., made 14 bbl. per day, but sand could not be controlled.

New discovery . . . Hondo is about 40 miles west of San Antonio and the "D-3" produces there. A new discovery well, 40 miles southeast of San Antonio near Poth, has recently been drilled to the "D-3," and at the time this is written it has not been potentialed. The well is a farmout from C. C. Winn, a San Antonio independent operator, and production will be from approximately 5,450 ft. Since this series of sands in various areas has different names, this sand may be the "D-3" because it is the last sand above the chalk.

Considerable chalk production occurs south of San Antonio in the Imogene area and also at Pearsall. Not all of the fields indicated on the map are Navarro production (Fig. 1).

Acknowledgment

For their courtesy in serving as sources of information the author thanks:

Ken Ring, district engineer, Shell Oil Co., Corpus Christi; Joe Parker, partner of Lewis Oil Co., San Antonio, interpreting a report by Carl Smith of Petroleum Service & Research Co.; C. C. Dauchy, independent producer, San Antonio; Gilbert Brown, independent geologist, San Antonio; Hugh Armstrong, partner of Armstrong & Horn, San Antonio; and C. C. Winn, independent operator, San Antonio.

EXPLORATION HIGHLIGHTS

APPALACHIAN

EASTERN KENTUCKY

Diamond Oil Co. stepped over two dry holes to extend the southwest part of the New Castle pool ½ mile. No. 1 (3) Merle Beatty, third quarter, New Castle Township, Coshocton County, Clinton was found at 3,158-3,204 ft. with only a small showing, natural, and 220 bbl. in 24 hours after treatment.

Two gassers were added to the new pool south of Danville in Knox County. Mickley and Workman 1 Beeman, Lot 3, Howard Township, with Clinton 2,758-2,800 ft. gaging 1,000,000 cu. ft., natural, and Frank Lyons Est. 1 Blubaugh, Section 6, Union Township, gaging 350,000 cu. ft., natural, from sand at 2,778-2,807 ft. Both wells were fractured, but had too much gas to gage through 2-in. tubing after treatment.

On Big Branch in the Floyd County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. has completed its 6277 John W. Spradlin as a Mississippian Maxon gas producer. Gas was encountered in two zones: 762 to 768 ft. and 878 to 888 ft. At total depth of 994 ft., well gaged natural 285,000 cu. ft. daily. Rock pressure was 223 lb. in 24 hours.

OHIO

One of the best of the recent producers in Flint Ridge pool has been drilled in and fractured. Scott Oil 1 Scott Kreager, Section 11, Hopewell Township, Licking County, made a good oil showing and 525,000 cu. ft. natural and gaged 7,660,000 cu. ft. with no report on the oil after treatment.

● The Great Lakes Carbon wildcat on Goldie Scott, Section 20, Liberty Township, Washington County, was plugged back to the Ohio shale after a long fishing job in the Clinton formation at 6,863 ft. The shale was shot with 8,500 lb. powder from 2,900-3,750 ft. and gaged 350,000 cu. ft. when shut in.

In Licking district, Tucker County, Hope Natural Gas Co., No. 9940 James E. Watson, has an open flow of 1,948,000 cu. ft. of gas in the Oriskany sand after shot. Efforts are being made to further increase the flow of gas. Hydrofracing and acidizing were not favorable. No. 9949 W. Asa Street, is drilling at 3,146 ft. Meadow Bluff district, Greenbrier County, Clear Creek Oil & Gas Co., 1 James McClurg, is at 2,500 ft. Sherman District, Hampshire County, M. E. Anderson, No. 1 J. E. & B. Orndorff, is drilling at 5,635 ft.

GREAT LAKES

MICHIGAN

Shows of Berea oil proved interesting, but operators elected to drill to Dundee objective without extensive tests of these oil shows at the John W. Jonson 1 Glady, NW SW SW 15-9n-9e, Marathon Township wildcat, Lapeer County.

Wildcat was checked in on top of Berea sand about 40 ft. higher structurally than this same objective was logged at surrounding correlation points, one located about ¾ mile north and the other 1¼ miles south. Top of Berea was logged at 1,444 ft., steel line and samples. First shows of dark brown oil, with little gas in evidence, were logged at 1,453-57 ft. After a 3-hour shut-down test at 1,458 ft., 20 gal. of oil were recovered off six bailers of fluid. Hole was making about a bailer of water an hour from open Coldwater lime. Best calculated estimate of well's potential at this point was a barrel of oil in 6 hours.

Hole was then deepened to 1,473 ft., with an increase in oil, and more pronounced increase in gas noted between 1,468-73 ft. Oil color at this point appeared to have lightened up. Still drilling in sand, operations were in progress below 1,491 ft. with 7-in. casing scheduled to be run at about 1,540 ft.

● Tests of Traverse oil show, following acidization with 100 and 200 gal., were abandoned at the Central Michigan Oil Co. 1 Getz, NE SE SW 15-13n-14w, Dayton Township wildcat, Newaygo County, but another test well was being planned for the area, probably to be located in the NE¼ 23-13n-14w, by Carlson & Sole, with support from Central Michigan Oil Co. and others. The 1 Getz was bottomed out at 2,324 ft. after top of Traverse was logged at 2,299 ft. Best recovery on tests following acid showed for 6½ bbl. of oil and 20 bbl. of salt water.

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EASTERN INTERIOR

ILLINOIS

Wayne County Well Settles to 80 Bbl.

Skiles Oil Corp. has completed a second well on the Haines Block, north of Golden Gate, in Wayne County.

The first well, which flowed over 600 bbl. from the O'Hara last month, has now settled to a steady 80 bbl. per day on pump. A second pay, the Rosiclare, developed strongly in the new 2 Haines and flowed 18 bbl. per hour. This lower pay was temporarily shut off in order to complete the higher O'Hara which, after perforation and acidizing, flowed at the rate of 14 bbl. per hour.

A west offset to the Haines Block was just brought in by another operator for 18 bbl. an hour from the Rosiclare, with a strong show in the O'Hara, which has not yet been completed.

ARK-LA-TEX

EAST TEXAS

Good Omen Field, Smith County, Gets New Pay

L. A. Grelling and American Liberty Oil Co. 1 Fannie Wilkinson has added a new pay, or opened a new pool, 1 mile north of present production in Good Omen field, Smith County.

Operators drilled the wildcat to 8,426 ft., then perforated in the Pettit limestone at 8,200-10 ft. Initial testing produced 5 bbl. of oil an hour through 10/64-in. choke. On potential test, the well flowed at the rate of 206 bbl. of 40.8°-oil a day through ¼-in. choke. Gas-oil ratio was 1,040:1. Tubing pressure was 640 psi.

Regular pay at Good Omen field is the Woodbine.

Sun Oil Co. 1 Elliott, Smith County's 15,000-ft. Smackover project 11 miles east of Tyler, was drilling ahead below 6,821 ft. Location is in the Chapel Hill field.

Confirmation Well at McBee Gas Field, Leon County

Sun Oil Co. has added a second, and larger, gas well to the new McBee field 5 miles southwest of Jewett in west-central Leon County. The firm's 1 Lizzie Barkley completed for an open-flow rate of 45,500 M.c.f. of gas a day from Rodessa pay at 8,777-87 ft. Shut-in tubing pressure was 3,347 psi.

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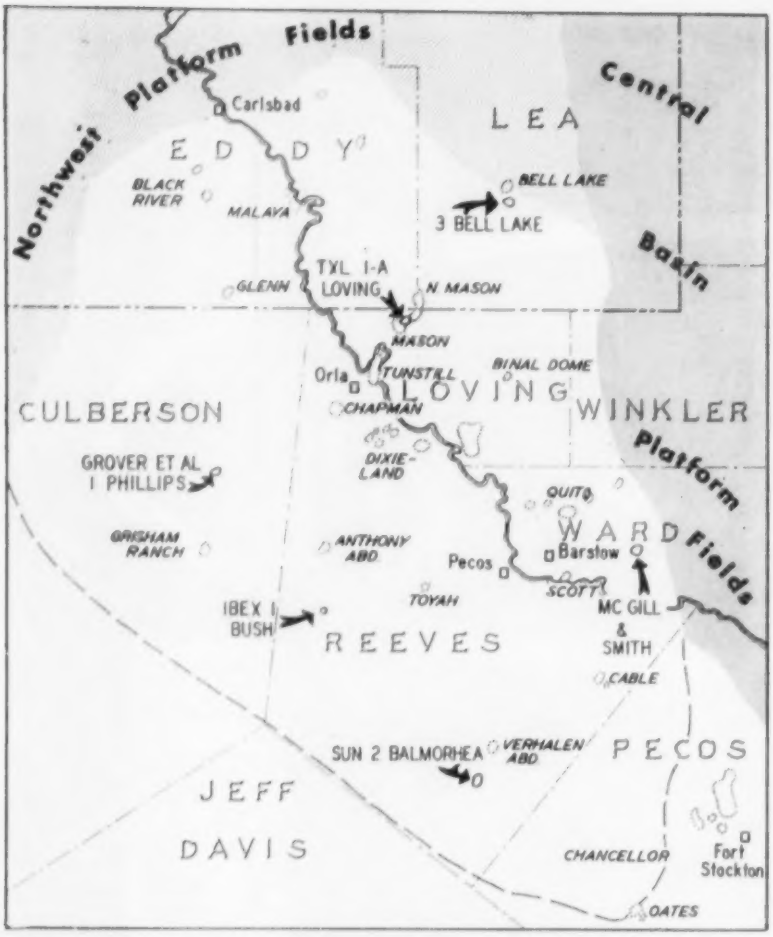

Toyah gas field, southwest of Pecos in Reeves County, gained its third well by Gulf and Phillips. The field as yet has no outlet. Scattered tests throughout the Delaware basin are seeking production from the Delaware sand and Bone Springs.

WEST TEXAS-NEW MEXICO

Delaware Basin Field Gets Third Gasser

Gulf Oil Corp. and Phillips Petroleum Co. have completed a third well in the Toyah (Siluro-Devonian) gas field in Central Reeves County, West Texas. Location of the field is 8 miles northeast of the town of Toyah, and about 10 miles west of Pecos.

Calculated potential on the 3 Toyah Unit was 86,000,000 cu. ft. of gas a day, open flow, from open-hole section at 12,796-12,826 ft., total depth. Completion test was figured from separate gages of 90, 70 60 and 60 minutes During the first 90 minutes, it flowed at the rate of 18,348,000 cu. ft. per day, under pressure of 3,837 psi. Choke sizes were not reported. On the last test the flow had increased to 22,145,000 cu. ft. per day, with flowing pressure at 3,427 psi. Open-hole section had been treated with 10,000 gal. of acid. Location of 3 Toyah in 24-C17-PSL is approximately 1 mile west of the second test, and 1 mile northwest of the discovery.

The same operators were drilling ahead on 4 Toyah Unit, southeast of the discovery. Gulf and Phillips' first well in the field was rated at 65,000,000 cu. ft. of gas a day, and all tests have shown for gas production in the Pennsylvanian around 11,000 ft.

Toyah field is probably the largest geophysical anomaly as yet discovered within the Delaware basin boundaries, and lies near the geographic center of the basin.

Basin exploration . . . Previous discoveries on the Texas side of the basin have been of short duration. Devonian gas production was found on the Grisham ranch in Culberson County, and Magnolia Petroleum Co. had Wolfcamp oil at 10,882 ft. in Cable field, southeastern Reeves County, but neither proved commercial.

Continental Oil Co.'s Bell Lake discoveries on the northern rim of the basin, in Lea County, New Mexico, have promises of developing a prolific field.

Basin Drilling Stimulated By Current Successes

Gulf and Phillips' new well, plus the current shallow play in fields and exploratory tests, should furnish the Delaware basin with a new stimulant. Year-end tax money, yet to be spent, should also affect this area.

On the deep drilling side, Continental Oil Co. is currently trying to add a new pay to the Bell Lake field in Lea County, New Mexico, and field sources report the planning of a Devonian wildcat for northern Loving County, West Texas. On the shallow side, the Quito and Monroe fields in Ward County are getting steady development, as is the new Pinal Dome field in eastern Loving County.

While most Delaware sand wells are relatively small producers, there are exceptions, such as Gulf's 1 Monroe, just completed as a north extension in the Quito area of western Ward County. Potential was a flowing 726 bbl. daily through ½-in. choke, with gas-oil ratio of 781:1. Pay section was open-hole at 4,800-15 ft.

In Mason field, Loving County, TXL Oil Corp. 1-A Loving fee was showing for a deep pay discovery. Initial testing flowed 23½ bbl. of new oil and 30 bbl. of water in 3 hours through 31/64-in. choke. Pay section was through perforations at 4,014-19, 4,026-31 and 4,036-39 ft. Top of the prospective new pay zone was 3,958 ft. on elevation of 3,053 ft. Operators reported the regular field pay sand tight.

Culberson County . . . Grover, Maccurdy & Knox 1 Phillips, 40 miles northwest of Toyah; had total depth at 1,750 ft., and last reported pumping 5 bbl. of oil a day.

Reeves County . . . Ford Chapman 1 Davis, 8 miles northwest Orla, found the sand at 2,708 ft. on elevation of 2,885 ft.; filled 1,150 ft. with fluid in 20 hours, estimated 80 per cent oil. Reported completed, but no further details.

The Ibex Co. 1 Bush-State, in the location stage, for a 3,800-ft. rotary test 12 miles northwest of Toyah.

Louis Crouch 1 Tunstill, Section 10, Block 56, an old well in Tunstill field, reported in line for deepening.

Sun Oil Co. 2 Balmorhea Ranches, 1 mile southwest of the firm's first dry hole, and 19 miles east of Balmorhea; drilling below 3,100 ft.

McGill & Smith 1 McGill & Smith, 2 miles southwest of Pyote, made location for a 5,000-ft. rotary test. Nearest Delaware sand pool is Lion, 4 miles to northwest.

Loving County . . . Ohio Oil Co. 1 Lineberry, 1 mile east extension test to Pinal Dome Delaware sand field, had the sand at 5,127 ft., set casing and was testing. Swabbing developed oil and salt water.

Lea County, N. M. . . . On the northern limits of the basin, Continental 3 Bell Lake Unit was testing in the Bone Springs. Perforations from 8,707-30 ft. developed 4½ bbl. of oil in 21 hours of swabbing. Location is southeast of the field's Pennsylvanian discovery at 14,941-15,025 ft.

HUGOTON EMBAYMENT

NORTHEAST NEW MEXICO

Rank Wildcat Indicates First Regional Production

Kelly, Moore & Rader Oil & Mining Co. 1 Martinez, 24-20n-26e, Harding County, appears to be the first discovery for this isolated area of New Mexico.

The Harding County wildcat pumped an estimated 10-12 bbl. of oil per day on first production tests at a total depth of 270 ft. The producing zone, 172-210 ft., is being called Dakota tentatively. A second wildcat in the area is completing and a third location spotted.

PACIFIC COAST

CALIFORNIA

Sunray Hits Deep Pool in Ventura County

A potentially important new pool discovery has been made by Sunray Mid-Continent Oil Co.'s deep wildcat in the west Mantalvo area of Ventura County.

After hitting good prospects at the 13,730 ft. level last June, the operators explored a couple thousand feet deeper. The move appears to have paid big dividends as a 17-hour test at the 15,024-15,157 ft. levels yielded 27.4°-gravity uncut crude at a 600-bbl. a day rate.

Sunray's potential new discovery, 1 Sunray-Ohio-Kraemer-Del Cielo, is located SE NE 31-2n-22w, and hit total depth at 15,450 ft. It is 1 mile southeast of E. L. Doheny and Richfield Oil Corp.'s 1 Laubacher. This well is now producing 250 bbl. daily through a 14/64-in. choke. Producing depth of 1 Laubacher is 11,126 ft. in the Sespe sand.

Sunray's 1 Del Cielo was shooting for the deep Sespe sand. Oil produced in the 17-hour test of the new well was from a previously untapped pool, according to geological evidence. The oil in this deep pay is believed to have been trapped along a fault which cuts across the west side of the nearby town of Oxnard. Perforations were to be made higher in the hole where promising sands were hit enroute to the total depth.

Standard Oil Co. is getting ready to join Sunray and Richfield by drilling a wildcat ½ mile south of Richfield's 1 Laubacher. Meanwhile Richfield officials reported plans were nearly complete for drilling 2 Laubacher on a site close to their discovery well. Richfield holds leases on 2,000 acres within the city limits of Oxnard, 1½ miles east of 1 Laubacher.

Signal Slates Second Try in Temblor Ranch Area

Signal Oil & Gas Co. is not giving up on the Temblor Ranch area in Kern County as the company announced they were ready to spud in their second well there. The new effort, 72-33 Signal-USL, will be located about 660-ft. north of the first well which was abandoned at 5,840 ft.

Sufficient shows were found in the original well to warrant this new test, the company said. Plans call for a total depth of 5,500 ft. with the Phacoides sand the objective. Location of the well is NE NE 33-29s-20e. This is on government leased land. In addition to 2,246 acres in the area leased exclusively, Signal has a joint lease with other operators on another 374 acres.

Fourth Shell Well Set for Strand Field

Shell Oil co. has slated another well near its recently discovered 1 Posuncula in Strand field. This latest try will be an easterly offset to the prolific 14,224-ft. discovery well which was completed last June. Shell has two other strings working in the field—one a westerly offset and the other a south offset.

Shell's 1 Posuncula has already produced more than 50,000 bbl. of high-gravity crude from the Vedder sand. Shell will also act as operator for the combined interests of Tide Water Associated Oil Co. and Continental Oil Co., holders of leases east of 1 Posuncula, under a recently concluded agreement.

More Production Seen For Vallecitos Field

Two more producing wells were in prospect for the recently discovered Vallecitos field in San Benito County. Shell Oil Co. 43-5 Shell-Artnell F & I and Long & Hedges' 2 H-H are the latest efforts in the new field. Shell's well showed 7,500 M.c.f. on a drill-stem test at 5,388-ft. plus 20-ft. of clear condensate. Long & Hedges' well hit oil sand at 5,400-ft. and was drilling ahead at 5,410 ft.

Shell's project is a northwesterly offset to Long & Hedges' discovery well while the latest Long & Hedges well is a northeasterly offset to the original well. The discovery well flowed 100 bbl. daily, 35° gravity, through a 10/64-in. choke. Production in this first well, 1-A H-H, is from upper Eocene formations. Location of the well is SW NE 5-17s-11e.

Abandon Yolo Deep Test

Yolo County's deepest well, General Petroleum Corp.'s 15,229 ft. 65-10 Glide Court, was abandoned last week. G.P. ran 7⅝ in. casing to 13,100 ft. in the test which was spudded last April but sidewall samples and electric logs failed to show any pay.

WESTERN CANADA

ALBERTA

Gas Discoveries Highlight Western Exploration

Natural gas discoveries in Alberta, just when top-level talks were taking place in Ottawa concerning export of the province's natural gas and construction of a pipeline to eastern Canada, highlighted the exploration and development phase of western Canada's oil industry this week.

Gas discoveries were reported for the Goose Lake area of central-east Alberta, the Bindloss district in the southeast section of the province, and the Wainwright sector of central-east Alberta.

The assured gas success in the Goose Lake area was chalked up by Richfield Oil Corp. of California at its Boldt exploratory venture 17 miles southwest of the town of Hardisty, and 46 miles east-northeast of Stettler. Hudson's Bay Oil & Gas Company, Ltd., is associated with Richfield in this venture.

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A small gas flow rate was recorded in the Viking sand at 7-8 Boldt, located on LSD 7, 8-42-12w4, but it has been indicated that the main producing horizon at the well will be the "Cameron sand" in the Blairmore which is just above the basal quartz contact. The single drill-stem test run in the Viking zone flowed gas at a maximum daily rate of 971,000 cu. ft. daily. During the series of tests run in the Cameron sand section, a maximum flow rate of 4,126,000 cu. ft. daily was recorded. The well was completed at a depth of 3,175 ft.

Backers of the Baysel-Unit-Bindloss wildcat project have been assured of gas from the first Bos Island sand zone. This gas strike, Baysel-Unit 7-19 Bindloss, on LSD 7, 19-22-3w4, is 5½ miles west of Bindloss railpoint and 4 miles east of the most easterly gas success in the Bindloss-Cavendish area. Bindloss railpoint is about 165 miles almost straight east of Calgary, near the Saskatchewan border.

The discovery test was run of the interval 2,185 to 2,210 ft. with the valve open 180 minutes and shut in 15 minutes. Gas flowed to the surface half a minute after the packer was opened and reached a maximum flow rate of 3,800,000 cu. ft. per day.

Wainwright . . . The well in the Wainwright area of Alberta which recorded a gas flow of 1.25 million cubic feet daily, is 9 miles northwest of Wainwright town and 4½ miles east-southeast of oil production in Wainwright field. Operating this new strike is Husky Oil & Refining, Ltd., with 50 per cent interest while the remaining 50 per cent is held by Wain-Con Oils, Ltd.

The Viking was topped at the 1,822-ft. mark. During a drill-stem test of the Viking interval 1,783 to 1,825 ft., gas flowed to surface in 1 minute at the rate of 1.25 million cubic feet daily. During this test the valve was opened 60 minutes and shut in 20 minutes.

The well, Husky-Wain-Con 10-21 Wainwright, is located on LSD 10, 21-45-5w4.

Bearspaw . . . Another well in Alberta, 3½ miles northwest of Calgary, being drilled by Western Leaseholds, Ltd., in the Bearspaw area, recorded a show of oil and gas during a drill-stem test in the Mississippian limestone.

This well, Western 22-9 Bearspaw, on LSD 9, 22-25-2w5, flowed natural gas to the surface at the rate of 87,000 cut. ft. daily. Pipe recovery consisted at 450 ft. of oil and gas-cut mud. A further test below 8,731 ft. gave a recovery consisting of 2,075 ft. of salty gasified sulfurous water. Crew is now

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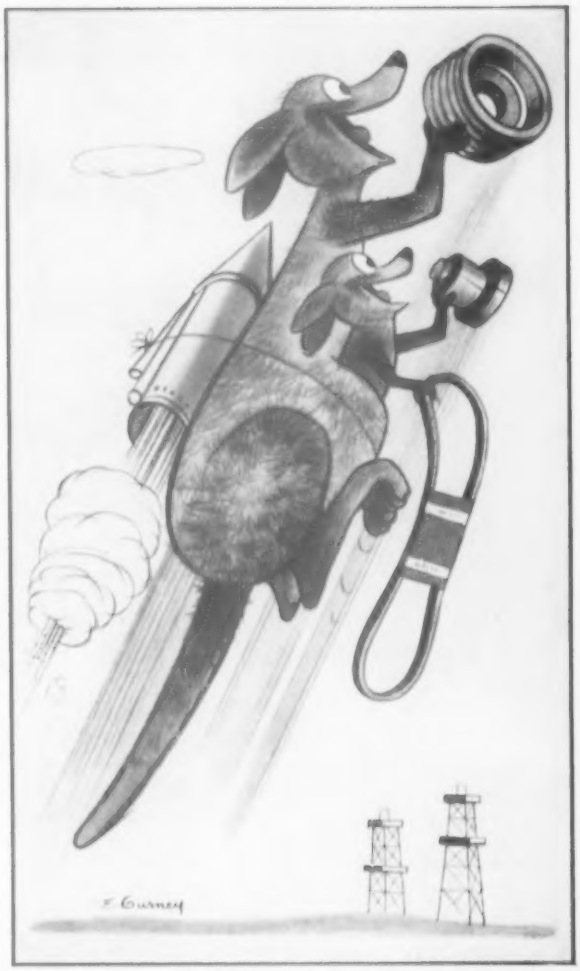

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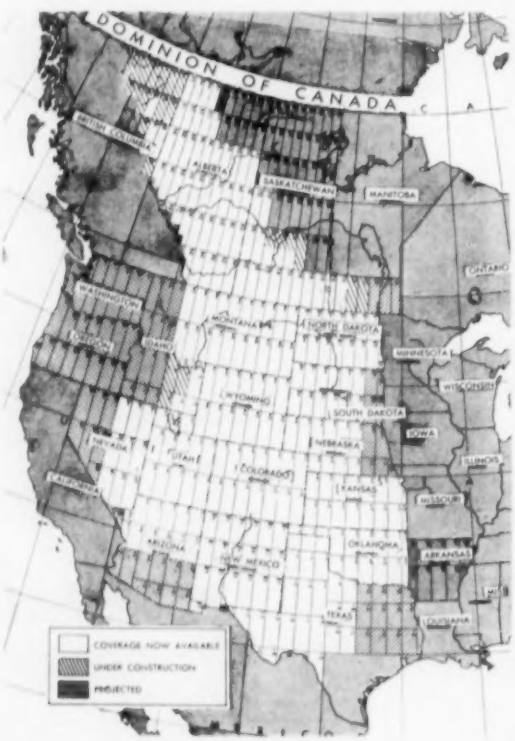

drilling ahead for its Devonian objective.

ROCKY MOUNTAIN

NORTH DAKOTA

Completion Near at New North Dakota Discovery

Tubing is being run at North Dakota's most important strike of the year. Sohio Petroleum Co. 1 Ritter, SE NE 23-163n-86w, Renville County, recovered 3,911 ft. of free oil from the lower Charles.

This new discovery is about halfway between Bottineau County and Nesson anticline production in the state. This is the second region in the state to show for oil production east of the Nesson anticline.

UTAH

New Tests Run at Coalbed Canyon Unit

Gulf Oil Corp. ran the first series of production tests at 1 Coalbed Canyon Unit in C SE SE 15-35s-25e, San Juan County.

Gages ranged from 8,000 M.c.f. of gas per day with distillate at the ratio of 18 bbl. per million cubic feet of gas. The tests were of perforations at 5,762-5,805 ft. The flow was 7,970 M.c.f. per day on 37/64-in. choke and 43 bbl. of distillate recovered in 7 hours. The gas flow was 3,782 M.c.f. per day on 30/64-in. choke with 18 bbl. of distillate per million. The pay zone is the Pennsylvanian.

Gulf is preparing to start another test on this unit which is 15 miles southeast of Monticello in the Paradox basin.

MONTANA

Oil Flow Reported at West Pendroy Wildcat

Continental Oil Co. 1 Briggs, NW SW NW 9-26n-6w, in the West Pendroy area of Teton County, flowed 4 bbl. of oil per hour on a 36-hour test of the Madison - Mississippian. Perforations were at 2,957-82 ft. This indicated discovery is more than 8 miles southwest of production.

ARIZONA

Cores Reveal More Shows at Apache Test

More showings have been found on cores at Humble Oil & Refining Co.'s 1 Navajo Tribal in the W½ NE SE 4-41n-28e, Apache County.

Cores from 5,702-10 ft. recovered limestone and dolomite, bleeding oil, and cores below this zone also had shows. The operator is drilling below 5,838 ft. Several weeks ago this well gaged about 5,000 M.c.f. of gas and some oil per day at about 4,900 ft. in the Pennsylvanian.

WYOMING

Crooks Gap Unit Test Is Apparent Discovery

Sinclair Oil & Gas Co. got 4,945 ft. of 44°-gravity oil on a test of the Nugget at their 11 Crooks Gap Unit in NE SE NE 13-28n-93w, Fremont County.

This would be the first oil from that formation in the field, and is the first ever recovered from the Nugget in the field. Top of the Nugget was registered at 5,565 ft. Production in the Crooks Gap Unit is from Muddy and Dakota-Lakota at 4,700 and 4,900 ft., respectively.

Muddy Confirmation at Manderson Is a Success

The confirmation well to a Muddy discovery in the Manderson area of Big Horn County is a success. It is Mobil Producing Co.'s F-43-18-G, C NE SE 18-50n-92w.

The well flowed more than 5,000 M.c.f. of gas per day from the Muddy sand at 5,772-94 ft. It is located 1 mile southeast of the F-14-12-G, C SW SW 12-50n-93w, which flowed 10,200 M.c.f. of gas daily and 21 bbl. of oil in 2 hours from perforations at 6,019-57 ft. in the Muddy. This area of Wyoming and the Big Horn basin should be watched in the next few months as a result of these Muddy discoveries.

GULF COAST

SOUTHWEST TEXAS

Second Gas Sand Opened In New Hidalgo Discovery

Westag Corp. and Clark Fuel Producing Co. have a 59,000,000-cu. ft. dry gasser at their 3 Westag, a new-pay discovery well in their new field 2 miles east of Sullivan City, in southern Hidalgo County, on the Rio Grande.

The well, 1,630 ft. northeast their discovery, 1 Westag, completed last April as a gasser in a Frio stringer sand at 2,798-2,805 ft., is productive from the deeper Shepley sand, perforated at 3,770-85 ft. Shut in, its pres-

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sure is 1,570 psi. Total depth is 4,651 ft.

The operator's second test, 2 Westag, north of the discovery well, was dry at 3,928 ft.

Hockley Sand Produces In New Starr County Field

Theljohn Oil Co. is opening a shallow, Hockley-sand oil field 8 miles northwest of Rio Grande City, in southern Starr County. Its 1 Reyna et al, the discovery well, is good for 27.60 bbl. of oil per day on the pump. Oil gravity is 23.5°. Pay is perforated at 624½-27 ft. with bottom of the hole at 1,258 ft. The operator's second test, a location south, is drilling.

New Tesoro Well Opens Vicksburg Oil Production

Vicksburg sand is proving productive in Tesoro field, in Duval County. First well to be completed in this zone is W. Earl Rowe's 1 Loving, which flowed at the rate of 73.3 bbl. of 28.8°-gravity oil per day in tests through 7/64-in. choke. Pay is perforated at 3,535-44 ft. Other production in the field is from Pettus-Yegua sands.

Dimmit County Discovery Indicates New Olmos Field

Discovery of another Olmos (Navarro) sand field in the Carrizo Springs area, of northwestern Dimmit County, appears to have been made by Sutton Drilling Co.

The indicated discovery well, 1 Asher McComb, flowed 50°-gravity condensate with drilling mud while cleaning through ¼-in. choke. It was shut in for storage before being gaged. Flowing pressure was 250 psi.

Indicated production is from perforations at 3,320-30 ft. in the second Olmos sand. A 5-hour drill-stem test of these perforations got 380 ft. of condensate with 180 ft. of muddy fresh water. Recovery was through ¼-in. choke with 420-psi. working pressure.

Location, in H&GN Survey, is 5½ miles southeast of Carrizo Springs, and about 2½ miles northwest of Asherton.

Oil Pay at Rowan Field Extended Southwestward

Production in the Rowan area, 3 miles north of Liverpool, in Brazoria County, is being extended southwestward with a new upper Frio well being completed by Clegg & Hunt and Bradco Oil & Gas Co.

Extension well, 1 Clement, is perforated at 8,544-46 ft. It flowed clean 40°-gravity oil through 5/64-in. choke with pressure of 750 psi. Flow was ungaged, and the well has been shut in for storage.

Rowan field has other oil production from the 8,500-ft. sand, and also produces gas and condensate from a sand at 8,900-9,100 ft. and a deeper pay at 9,800 ft. The new well was drilled to 10,715 ft.

In the immediate Liverpool area, several miles south of the Rowan area, Ada Oil Co. has a new-pay discovery at its 1 Todd Unit 2, completed with perforations at 10,814-24 ft. The well flowed 101.48 bbl. of 34.4°-gravity oil per day during completion gage through ¼-in. choke. Total fluid carried 10 per cent water. Tubing pressure was 250 psi., and gas-oil ratio 1,199 cu. ft. per barrel.

SOUTH LOUISIANA

Pointe au Fer Discovery Makes Large Gas Flow

Potential of Republic Natural Gas Co.'s recently completed gas-condensate discovery well 1 mile southwest of the shallow Pointe au Fer area in Terrebonne Parish's coastal marshes is placed at 30,500,000 cu. ft. of gas per day. Condensate recovery is calculated at 12.5 bbl. per million cubic feet. Flowing pressure ranged from 4,678 psi., in tests through 7/32-in. choke, to 4,890 psi., through 5/32-in. choke. Shut-in pressure is 6,235 ft.

The well, 1 Nelson, is completed with perforations at 11,763-75 ft. It has more than 200 ft. of gross sand with 100 ft. of net porosity.

Saint Charles Parish Gets New Gas-Condensate Field

John W. Mecom and Freeport Sulphur Co., operating jointly, have a new gas-condensate discovery well 1½ miles north of Bayou Couba field, 15 miles southwest of New Orleans in southern Saint Charles Parish.

It is their 1 Waterford, in 2-15s-21e, completed with a potential flow of 149 bbl. of 47.5°-gravity condensate and 2,450,000 cu. ft. of gas per day through 5/32-in. choke. Completion is from perforations at 11,516-34 ft. Flowing pressure gaged 3,850 psi.

The well is scheduled to be completed dually with perforations also being made in a slightly shallower gas-condensate zone at 11,403-16 ft.

Location also is about 3½ miles southeast of Boutte field.

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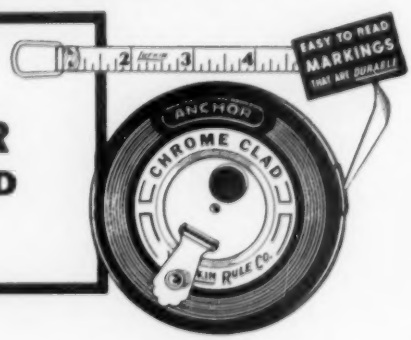

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MISSISSIPPI

Black Warrior-Mississippi Southern Appalachian Map

The Austin Map Co., Bewley Building, Fort Worth, has available a revised geological map of the Black Warrior and Appalachian (southern) region showing portions of Mississippi, Florida, Alabama, and Tennessee. Recent discovery wells are posted on the map. Scale is 1 in. equals 8 miles. Pools, counties, railroads, and towns are shown on the map.

MID-CONTINENT

OKLAHOMA

Hunton Tested at New Oklahoma County Prospect

The Hunton lime has been proved at 1 Cuttings in NE NE NW 14-14n-1e, by Powell Briscoe, Inc. This well is north of Northeast Luther field, a small eastern Oklahoma County pool.

The well flowed an estimated 25,000 M.c.f. of gas per day, spraying distillate in 3 minutes on a test at 5,070-5,122 ft. Recovery on the drill-stem test was 100 ft. distillate.

Revival of Old Gas-Distillate Area Due

Kingwood Oil Co. has revived the prospects of production in an old Bradley gas-distillate area in Grady County.

The 1 Maurer in SW SE 21-5n-5w, flowed 5,200 M.c.f. of gas per day on a drill-stem test at 10,435-10,512 ft. in the Springer sand. Distillate sprayed with recovery being 233 ft. of 56°-gravity fluid and 50 ft. mud-cut distillate.

Two More Oil Wells Completed at Short Junction

Cleveland County's West Short Junction field has two more oil wells. Continental Oil Co. finaled the 1 Rowland-A, C NE SE 21-10n-4w, for 333 bbl. of oil per day on ½-in. choke from perforations at 8,168-8,252 ft. in the Hunton lime.

Sun Oil Co. 2 Maruska, C SE SW 15-10n-4w, flowed 306 bbl. of oil in 24 hours on 1-in. choke from perforations at 8,040-8,116 ft. Sun has another well going in C NW SW 15.

This south-central Oklahoma field has twenty-seven successful oil-well completions, making it one of the most attractive new areas in the state. High flows of oil have been reported at all the wells. The pay zone is the Hunton lime. The twenty-seventh well in the field made 1,173 bbl. of oil daily at 8,252 ft. It was the 4 Castleberry, 22-10n-4w. Short Junction field itself was inactive for some time until the extension discovery that opened West Short Junction and the subsequent development that rapidly moved through 10n-4w.

More Pay Tested at Nellie Area Discovery

Carter Oil Co. has found more gas-distillate pay at its 1 Picard in SE NE SE 6-1n-8w, Stephens County.

This Nellie district pool-opener flowed 10,600 M.c.f. of gas per day on a test at 3,778-88 ft. and 3,788-3,817 ft. A 1-hour test at 3,859-88 ft. got 2,147 M.c.f. of gas per day but declined to 1,500 M.c.f. at the end of the opening. A drill-stem test of the zone 3,944-53 ft. flowed oil in 32 minutes, making 19½ bbl. in 1 hour on the 105-minute opening.

Jefferson County . . . Carter completed a good well in this county's Northwest Healdton field. The 2 Robberson heirs in SE NE SE 23-3s-4w, swab-tested 35 bbl. of oil on a 10-hour test of perforations in the upper Fusilinid at 1,199-1,220 ft. After fracture the well flowed 334 bbl. of 38°-gravity oil in

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4½ hours on a ¾-in. choke. This is a daily rate of 1,780 bbl. Gas-oil ratio was 260:1. Surface casing has been set at the 3 Robberson heirs in NW NE SE 23-3s-4w.

New Pool Opened in Tillman County Area

A new Strawn conglomerate field has been opened in southwestern Oklahoma's Tillman County at Falcon Seaboard Drilling Co. 1 Robey, NW NW SW 35-3s-18w. The well is south of Frederick area production.

A drill-stem test at 5,514-24 ft., open 90 minutes, showed gas in 8 minutes at 500 M.c.f. per day. Oil flowed in 1 minute. Another test was made at 5,514-34 ft. A third test is being taken at 5,514-47 ft. The well's operator estimates about 30 ft. of pay zone at this test.

Successful Wildcats

ALBERTA

Can. Export Gas 7-20 Sedalia, LSD 7, 20-31-5w4, TD 3,060 ft. Viking gas well.

SASKATCHEWAN

Central Del Rio 10-32 South Ralph, LSD 10, 32-6-13w2, TD 4,652 ft. Mission Canyon oil well.

BRITISH COLUMBIA

Imperial Hudson's Bay Union 1 Paddy, unsurveyed territory, TD 10,034 Devonian gas well.

COLORADO

Adams County: Sohio Petroleum Co. 1 UPRR Noonen, SW NW SW 15-3s-59w, IP 800 M.c.f. of gas per day, 12 BOPD, "D" sand discovery, new field, TD 6,298 ft.

Morgan County: Kimbark Co., Sterling Drilling Co. 1 "D" Queen, NW SE SW 23-1n-56w, IPP 30 BOPD "D" sand discovery, new field, TD 5,264 ft. "J" sand.

Lion Oil Co. 1 Sam, C NW SW 7-1n-56w, IP 1,400 M.c.f. of gas per day, "J" sand discovery, new field, TD 5,394 ft. "J" sand.

SOUTH LOUISIANA

Saint Mary Parish: Sun Oil Co. 1 Saint Mary Parish Land & Trust, Township 17s-10e. (Belle Isle dome). Shut-in gas-condensate well, no gage, perforations 12,079-83 ft. TD 15,500 ft. (New reservoir, and extends production on Belle Isle dome.)

Fifteen Oil Co. 26 South Coast, 30-13s-10e. IP 166 BOPD, ⅛-in., 35.5°, perforations 7,180-90 ft., and (dual completion) IP 138 BOPD, ⅛-in., 33.3°, perforations 9,880-90 ft. TD 9,965 ft. (New pay—9,880-90 ft. sand—in Charenton field.)

NEBRASKA

Cheyenne County, Sell Petroleum, Inc. 1 Sell, C SE NW 18-15n-48w, IPP 50 BOPD, "D" sand discovery, new field, TD 4,685 ft. "J" sand.

LEGAL

Sealed bids will be received until 2:00 P. M. Thursday, September 15, 1955, and opened at that time at the Pawnee Sub-Agency, Pawnee, Oklahoma, for the leasing of allotted lands located in Kay, Noble, Pawnee and Payne Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Johnson, area field representative of the Pawnee Sub-Agency office (phone 985).

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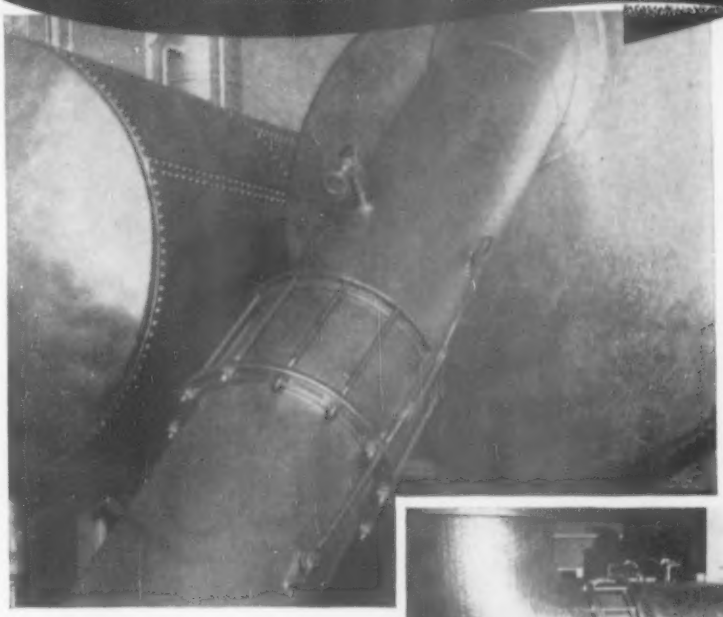

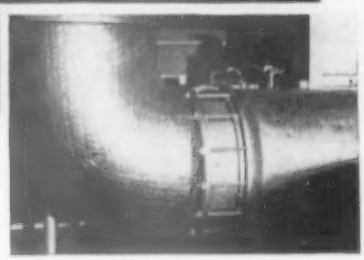

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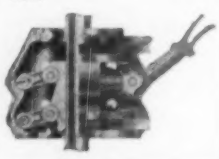

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Kimball County, Smith: Transit Syndicate 1 Smith, C SW SE 14-16n-57w. IPP 9 BOPD, "J" sand discovery, new field. TD 6,906 ft. Skull Creek.

Madden: Wytex Service, Rex Monahan, Anderson-Prichard 1 Madden, SW SW NE 27-14n-54w. IPP 51 BOPD, "J" sand discovery, new field. TD 6,064 ft. "J" sand.

SOUTHEAST NEW MEXICO

Lea County: Warren Petroleum Corp. 1 Federal-Simmons, 7-9s-38e. IP 600 BOPD, ¼-in., TP 450 psi., GOR 280, 42°, elev. 3,987 ft., top Devonian 11,601 ft., top pay 11,618 ft., perforated 11,618-11,642 ft. TD 11,689 ft.

Ventura County: Bell & Burden 1 ACL, SE NE 36-4n-23w, IPP 75 BOPD, 28° gravity, perforations 2,345-2,635 ft., TD 5,770 ft., plugged back to 2,640 ft. (New field discovery in Weldon Canyon.)

OHIO

Washington County: Great Lakes Carbon Co. 1 Goldie Scott, Sec. 20, Liberty Twp. IP 350 M.c.f. daily, Ohio shale 2,900-3,750 ft., TD 6,863 ft.

OKLAHOMA

Hughes County: Jedsco 1 Condreay, SW SW NE 23-6n-9e. IPP 15 BOPD, pay 2,931-51 ft. TD 3,120 ft.

Tillman County: Shirley Thompson and Phillips Petroleum Co. 1 Akin, NE NE NW 8-3s-17w. IPP 3 BOPD, Canyon 3,064-74 ft. TD 4,710 ft.

TEXAS GULF COAST

Fort Bend County: Russell Maguire 1 Moore, BBB&C Sur. 19, A-135. IP 257.07 BOPD, 11/64-in., 39.6°, perforations 8,230-55 ft. (Cockfield-Yegua). TD 8,774 ft. (New field.)

Lavaca County: Texas Eastern Production Corp. 1 Vaughn, T&NO Sur. 11, A-580. IP 29.73 BOPD, 7/64-in., 45.8°, perforations 5,631-35 ft. TD 9,250 ft. (New field.)

Nueces County: Wiley P. Singleton 1 James Ewing estate, George H. Paul Subdivision, Sec. 30, Driscoll Ranch. IP 125 BOPD, 5/32-in., 47°, perforations 5,584-90 ft. TD 5,597 ft. (New field.)

Carll Oil Co. and Shore Exploration Co. 1 Lagrone, Caudrilla Irrigations Sur. 139, A-577. IP 86 BOPD, ⅜-in., 32°, perforations 4,733-34 ft. TD 4,739 ft. (New field—North London Gin.)

SOUTHWEST TEXAS

Jim Wells County: Sid Katz et al. 1 Clegg, Los Presenos Grant, Block 1, Sec. 5, Scott Subd., Beton Ranch. IP 24,000 M.c.f. daily, open-flow potential, 12 BC per M.M.c.f., perforations 5,787-95 ft. and 5,797-5,802 ft. (Vicksburg). TD 6,500 ft. (New pay in South Bentonville field.)

Cecil B. Burton 1 Singer, Los Presenos de Abajo Sur. 4-A. IP 3,500 M.c.f. daily, open-flow potential, dry gas, perforations 3,412-17 ft. TD 3,470 ft. (New field.)

WEST TEXAS

Crane County: Evans Production Corp. 1 Payton Royalty Co., Sec. 101, B. L. Frot Sur., 9 mi. S Crane. IPP 32 BOPD, 29°, GOR zero, pay 2,400 ft. TD 2,578 ft.

Garza County: C. R. Inman 1-B Roy, 119-5-H&GN, 5 mi. NE Justiceblrg. IPP 10 BOPD, pay 2,570 ft. TD 2,687 ft.

Pecos County: W. F. Stricklin 1 White, 89-194-GC&SF. IPP 25 BOPD, 34°, pay 1,885 ft. TD 1,895 ft.

Sutton County: El Paso Natural Gas Co. 1 Berry, 90-D-H&WT, 2 mi. N. Sonora. IP 7,300 M.c.f. gas, calculated open flow, GOR 123,000:1, pay 5,472 ft. TD 6,206 ft.

El Paso Natural Gas 1 Thompson, 62-A-HE&WT, 10 miles N Sonora. IP 5,250 M.c.f., calculated open flow, pay 5,320 ft. TD 5,615 ft.

WEST CENTRAL TEXAS

Callahan County: J. E. Connally 1 Garrett, H. Moscrip Sur. 15, 6 mi. N Cross Plains. IPP 121.8 BOPD, 40°, GOR 350, pay 4,026 ft. TD 4,201 ft.

NORTH TEXAS

Archer County: W. B. Hamilton 1-D Ikard, James Webb Sur., A-664, 6 mi. SW Archer City. IP 125 bbl. oil in 6 hr., 13/64-in., 42°, TP 275 psi., GOR 350, Mississippian 5,180 ft. TD 5,191 ft.

Cooke County: Hill & Hill 1 Weinzanpfel, MEP&P Sur. 769, 3½ mi. SW Muenster. IP 166 BOPD, 16/64-in., 39°, GOR 150, TP 160 psi., Ellenburger pay 2,076 ft. TD 2,092 ft.

Young County: Anderson Oil Co. 1 King, TE&L Sur., A-735, 7½ bi. SW New Castle. IP 110 BOPD, ¾-in., 42°, TP 100, GOR 300, pay 3,600 ft. TD 3,620 ft.

Cox Drilling Co. 1 Daws, TE&L Sur. 751, A-756, 6½ mi. NW Murray. IP 130 BOPD, 10/64-in., TP 400 psi., GOR 350, conglomerate 4,363-75 ft. TD 4,728 ft.

Sunray Mid-Continent Oil Co. 1 Watson, I&GN Sur., A-1462, 1 mi. S New Castle. IP 121 BOPD, 9/64-in., TP 700 psi., 41.7°, GOR 513, pay 4,530 ft. TD 4,612 ft.

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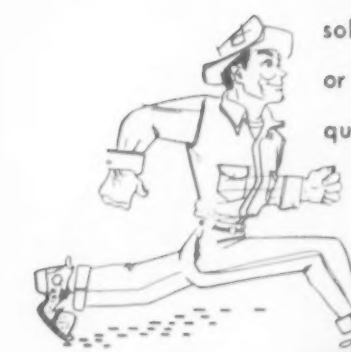

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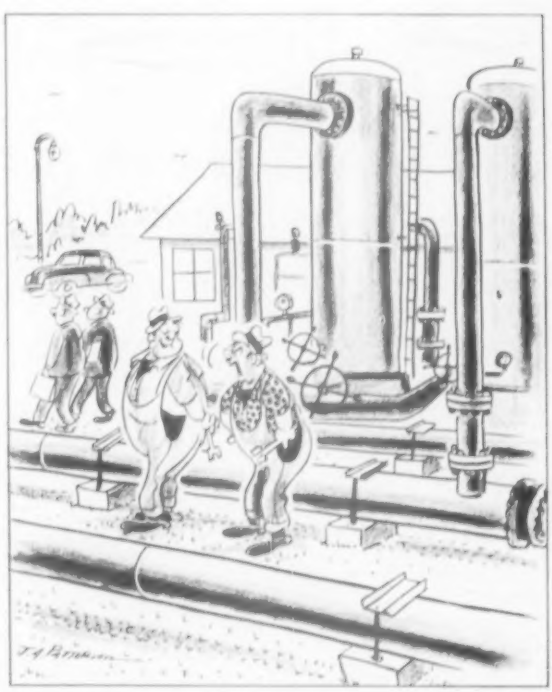

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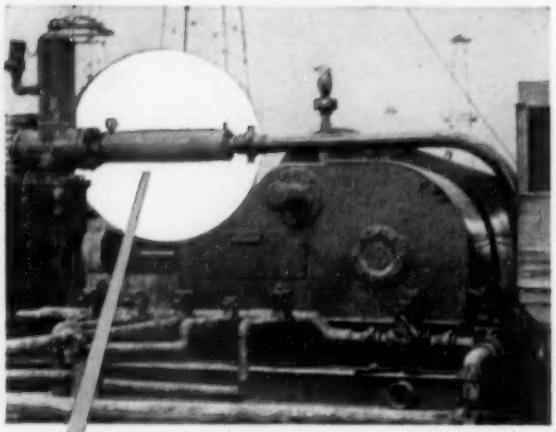

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Simpson Promoted

Ex-pumper will coordinate Gulf's western operations

Oil companies weren't recruiting many prospective graduates on college campuses when N. C. Simpson got his degree from Texas A.&M.

That was back in 1933, in the heart of the depression, and Simpson's sheepskin wasn't very impressive. At least it didn't impress his fellow pumpers in Crane County, Texas, where Simpson started his career with Gulf Oil Corp.

Most of Simpson's experience in the oil industry has been in the production end of the business. And he's done right well at it. Last week he was preparing to move from Houston to Pittsburgh, where he will assume a newly created post in Gulf's production department as operations coordinator for the Western Hemisphere.

Born oil man . . . A native of Brownwood, Tex., Simpson got acquainted with the oil industry at an early age. "I just grew up in it," he says.

His father was a foreman for Magnolia Petroleum Co. for many years and now is head of the Texas Railroad Commission's district office at San Angelo.

Before finishing college, Simpson spent his summers in the oil fields. His early experience ranges from roustabout for Magnolia, to pipeliner for Humble Pipe Line Co.

As soon as he finished college, Simpson went back to the oil fields. "The main thing you wanted was just a job," he says. And he found a job —as pumper—with Gulf. He's been with the company ever since, except for 3 years during World War II when a bomber group in India and Burma needed a first lieutenant more than Gulf needed a production man.

Prior to his Army career, Simpson had acquired a new title—petroleum engineer—and a wife—Pauline. He got both at Odessa, Tex. After serving as production engineer, district petroleum engineer, and zone petroleum engineer in West Texas, he was promoted to assistant superintendent of production for the Fort Worth district in 1948.

Two years later, he went to Houston as executive assistant to the vice president in charge of the production division. In December 1953 he was promoted to production manager for the Houston division, the job he is leaving to go to the company's general offices in Pittsburgh.

New life . . . Simpson, described by one of his subordinates as a "good old West Texas boy," is only 43 years old.

In Pittsburgh, Simpson will work directly under R. L. Boggs, vice president in charge of Gulf operations in the entire Western Hemisphere. But that's about all he knows about his new job.

He would like to think that the promotion means he will have more time for his long-neglected golf game and a better opportunity to hunt and fish. But he's not counting on either.

William S. Floyd, assistant director for materials with the Office of Defense Mobilization, has resigned to return to Shell Oil Co., effective October 1. His successor will be **Frank C. Ogden.**

Dr. Herbert R. Jensen, professor of education and director of the Instructional Materials Center, Colorado State College of Education, has joined the staff of the American Petroleum Institute as supervisor of educational activities.

Swanton D. Dalton, former manager of the manufacturing department's refinery engineering division of Socony Mobil Oil Co., Inc., has been appointed to the newly created position of assistant general manager of manufacturing in charge of technical coordination. **Edward L. Sinclair,** general manager of the company's refinery at Paulsboro, N. J., succeeds Dalton as refinery engineering division manager. **L. Erlis Cranston,** assistant general manager of the Paulsboro refinery, has been named to succeed Sinclair.

George Cormack has been named Calgary area drilling superintendent by Shell Oil Co. He succeeds **S. B. Deal,** who was transferred to the U. S.

R. A. Dresselly has been promoted to technical specialist in the technical service division of Humble Oil & Refining Co.'s Baytown, Tex., refinery.

Carlton L. Horine, former senior production engineer at the U. S. Naval Ordnance Test Station, Inyokern, Calif., has joined the development department of Brea Chemicals, Inc., Brea, Calif., as senior process engineer.

Sam J. Brown has been appointed contract representative of drilling operations for Helmerich & Payne, Inc., Tulsa. A fighter pilot in the Pacific and European theaters during World War II, Brown the past 5 years has taught at the University of Tulsa and the University of Texas and done management consultant work.

Clint Darnall, of Atlantic Refining Co., has been elected president of the North Dakota Geological Society for 1955-56. Other officers are **George Stocker,** Northwest Geological Service, vice president; **Frank Foster,** Ohio Oil Co., secretary; **E. B. Cole,** Cities Service Oil Co., treasurer; **M. W. Wolf,** The California Co., past president; and **William Barnes,** Sinclair Oil & Gas Co., executive committee member.

W. CALDWELL

Watson Caldwell, district geologist for Sunray Mid-Continent Oil Co. at Lake Charles, La., has been promoted to Gulf Coast division geologist with headquarters in Tulsa. He replaces **Joe Peerson** who resigned. Caldwell is a graduate of the University of Oklahoma.

W. J. Thornton has been named division manager of Murphy Corp.'s newly formed Shreveport office. Thornton, who joined Murphy in 1951, has served for the past 3 years as general production superintendent in the firm's home office at El Dorado, Ark. **Stratton Bull,** who was recently transferred from the

PERSONALS

firm's Billings, Mont., office, was named division geologist at Shreveport. **Marion Buchanan** was named division land man.

Hansel King Riddle, president of Oroco Oil & Gas Co., has transferred his offices from Ontario, Ore., to Payette, Idaho.

Lawrence W. Fox and **Mitchell May, Jr.,** have been elected to the board of directors of Bonnyville Oil & Refining Corp., Montreal.

Weldon E. Cartwright has resigned as district geologist for Warren Petroleum Corp. at Lafayette, La., to enter the consulting business there.

W. G. McCampbell, Jr., has been promoted from staff geologist at Houston by Humble Oil & Refining Co. to acting division exploration geologist at Tyler, Tex.

H. D. Bedford has been named area exploration manager of the Casper, Wyo., area of Gulf Oil Corp. Bedford joined Gulf in January 1923 as an employe of the production department of the old Gypsy Oil Co.

E. J. Langston, B. M. Allen, and **Bill Young,** formerly with Empire Drilling, have formed Western Prairie Oil, Inc., Denver, and will concentrate on exploration in the Denver - Julesburg basin. Langston is president, Allen vice president, and Young secretary-treasurer.

Walter B. Dingle, former western division engineer at Calgary for Imperial Oil, Ltd., has been appointed manager of the new Edmonton division in a reorganization of western Canadian exploration and producing operations. **Harold W. Stoneman,** producing coordinator at Regina, becomes assistant manager at Edmonton. **Vernon H. Hunter,** Calgary, becomes division manager at Regina. **A. L. Laberge** becomes production manager at Edmonton, succeeding **R. V. Welch,** who was transferred to Calgary as assistant regional production manager. **George A. Bannantine,** assistant production manager, Calgary, becomes production manager for the eastern division at London, Ont. **D. B. Layer** is the new exploration manager for the western region at Calgary. **R. W. Landes,** assistant exploration manager, Calgary, was named to direct exploration research for the region. **John D. Harvie** is the new western regional engineer at Calgary.

V. R. Farlow, a member of Gulf Oil Corp.'s petrochemical activities unit, and **Robert L. Grun,** Gulf product technologist, have been assigned to the chemical department. Both will remain in Pittsburgh.

Harold M. Morrow, former crude-oil purchaser for Crown Central Petroleum Corp in Abilene, Tex., has been transferred to the company's Houston office. The Abilene purchasing office was closed.

William T. Eskew, Jr., has been appointed chief engineer with Southern Pacific Pipe Lines, Inc., with headquarters in Los Angeles.

William E. McKitrick, senior geologist with Shell Oil Co. in Calgary, has been assigned to the Los Angeles office to coordinate organization procedures and technical personnel. The administrative position is a new one. McKitrick joined Shell in 1938.

George Myers, operating superintendent of Ashland Oil & Refining Co.'s Canton, Ohio, refinery since 1952,

GEORGE MYERS

W. N. MARX

has been appointed superintendent of the Catlettsburg, Ky., refineries; **Walker N. Marx,** superintendent of the Ashland oil plant in Catlettsburg since 1952, was named refinery superintendent at Canton. Marx succeeds **William B. Borst,** superintendent at Canton since 1947, who is being transferred to company headquarters at Ashland, Ky.

G. N. Babcock, former independent producer at Wichita and Chanute, Kans., has been elected president of Oil & Uranium Development Corp. at Rapid City, S. D. **E. B. Towne, Jr.,** independent geologist at Billings, Mont., has moved his headquarters to San Francisco.

Sherman D. Archbold, manager of the inland - waterways department of Esso Standard Oil Co. for 4 years, has been named to transportation coordination committee of Standard Oil Co. (N. J.). Archbold will coordinate tanker construction for affiliates of Jersey Standard. His successor will be **J. E. Stoveken,** marine manager, Lago Oil & Transport Co., Ltd., Aruba, N. W. I.

Ray Courtwright, field engineer for Stanolind Oil & Gas Co. at North Cowden, Tex., has been named drilling and production engineer for B. L. McFarland, Inc., Midland, Tex.

Howard E. McKinney, senior engineer for Shell Development Co., has been named manager of the newly created engineering department of the firm's exploration and production research laboratory in Houston. McKinney joined Shell's research staff in 1943. After graduating from the University of Oklahoma, he was a member of the University of Texas faculty for several years and also worked on wartime projects for the National Defense Research Council.

H. J. Nichols has been appointed secretary of the operations committee of Creole Petroleum Corp., replacing **E. D. Uhler** who resigned. Other Creole personnel changes: **J. F. Dean,** named assistant head of the petroleum engineering section, production department, Caracas, and **Paul N. Weidner,** named head of the petroleum engineering section, production department. Weidner succeeds **W. S. Glendening,** who becomes assistant western division manager at Maracaibo.

Warren M. Marshall has been transferred from Shell Oil Co.'s area production office in Los Angeles to Long Beach as a development engineer. **Millard L. Woodson,** formerly junior mechanical engineer in the area production office, has been promoted to mechanical engineer and transferred to Bakersfield. Shell Mechanical Engineers **Edward B. Johnstone** and **George H. Holliday** swapped locations. Johnstone, formerly in the Salt Lake City office, has been transferred to Farmington, N. M., while Holliday, who was at Farmington, has moved to Salt Lake City. Other Shell personnel switches include: **Robert E. Phelan,** mechanical engineer, transferred from Ely, Nev., to Ventura, Calif., Development Engineer **Donald K. Murray** transferred from Salt Lake City to Long Beach; and **Archie G. Soden,** petroleum engineer, switched from Long Beach to Bakersfield.

PERSONALS

Mel E. Lightfoot and **James E. Dotson** have formed Tulsa Oil Producing Co., a partnership headquartered in Tulsa.

Stephen A. Tower, engineer with Arkansas Fuel Oil Corp., Houston, Tex., has been promoted to district manager at Longview, Tex.

C. H. Dulaney, vice president of Dulaney Oil Co., has moved from Laredo, Tex., to Fort Worth, to which company offices have been transferred.

Jeff A. Robertson, chairman of the Kansas Corporation Commission, has announced his resignation effective October 1. Robertson said he would specialize in oil-industry matters coming before the commission.

CULBERTSON

Dr. J. A. Culbertson, former assistant manager of exploration for Continental Oil Co., has been named exploration manager. He succeeds **Dr. L. F. Athy,** who has retired because of ill health. Culbertson will remain in Houston. He has been with Conoco since 1933 when he joined the company's geophysical division at Ponca City, Okla. He has served as assistant division geologist at Houston, division geologist there, and chief geologist at Ponca City.

P. C. Pinkerton, Jr., engineer with American Oil Co., has been transferred temporarily from Texas City, Tex., to New York City. **Carl L. Hefner,** production engineer at Graham, Tex., for Cities Service Oil Co., has been transferred to Oklahoma City.

Byron Andrews, Abilene, Tex., and **Richard Herscher,** Denver, have joined the geology field staff at Kin-Ark Oil Co. Andrews, formerly with Lion Oil Co. and a consultant in West Texas, will be stationed at Kin-Ark's El Dorado, Ark., headquarters. Herscher will work out of Denver.

W. A. Paulea, formerly of Skelly Oil Co., has been named secretary-treasurer and general manager of Hoil Engineering Corp., Tulsa. Hoil also appointed **W. O. Morse,** formerly in Shell Oil Co.'s gasoline division, as chief engineer in charge of plant fabrication; **Jack Frese,** field engineer in the Rocky Mountain area, with headquarters at Fort Morgan, Colo.; and **F. J. Bradford,** Gulf Coast division manager, located at Houston.

Charles W. McClintock, former engineer trainee with Sohio Petroleum Co., Oklahoma City, has been promoted to junior engineer at Centralia, Ill.

J. B. Allinson and **Frank A. Schultz,** Dallas, have been elected to the board of Cotarco, Inc., which plans to construct a coal carbonization plant at Walsenburg, Colo.

Claud L. Wright, Tulsa, has been named president of a newly organized firm, Corrosion Control, Inc., which will provide services to operators of pipelines, tanks and tank farms, refineries, gasoline plants, oil wells, head-exchange equipment, and marine equipment. Other officials are **Walter E. Schott, Jr.,** vice president, and **John F. Searcy, Jr.,** vice president.

R. W. Dudley, formerly with Kerr-Dudley & Co., Fort Worth, Tex., has opened a petroleum consultant's office in Oklahoma City.

Beryl K. Bean, geologist for Gulf Refining Co. at Evansville, Ind., has resigned to become a consultant at Evansville.

E. S. Arnold, formerly assistant superintendent with Phillips Petroleum Co. at Ponca City, Okla., has been transferred to Calgary where he will be assistant superintendent in the production department.

Glen M. Ford, district geologist for The Texas Co., has been promoted to senior geologist at Tulsa. Ford, educated at the University of Illinois, joined Texaco in 1946 as a geologist at Mattoon, Ill. His successor is **B. K. Crumpley,** who joined the company in 1949 after graduating from the University of Oklahoma.

DEATHS

Isaac McKinley (Dad) Gearhart, 94, who was connected with the oil business for more than half a century, died in a Tulsa hospital recently following a 2-month illness. He had been an independent oil broker from 1920 until early this year after serving in the land department of The Texas Co. for some 20 years. A native of Wiliamsport, Pa., he was the father of Don R. Gearhart, vice president of Sinclair Oil & Gas Co., and Raymond I. Gearhart, chief draftsman of the land department of Amerada Petroleum Corp., both of Tulsa.

H. Earl Clack, 73, Havre, Mont., an oil marketer since 1919, died in Great Falls, Mont., September 2. He was chairman of the board of H. Earl Clack, Inc., and a director of Husky Oil Co., which acquired his marketing firm last year.

R. W. Simpson, oil man and banker, died September 3 at Ada, Okla., his home since 1903. He was the father of R. W. Simpson, Jr., independent oil operator at Tulsa.

William Keen, 63, manager of domestic operations for Atlantic Refining Co. before his retirement in July, died recently in a hospital at Bryn Mawr, Pa. Keen had been associated with Atlantic since 1907 and was a member of the operations and engineering committee of the American Petroleum Institute. He made his home at Bala-Cynwyd, Pa.

Fred Guy Sarber, 70, independent operator at Wewoka, Okla., and general superintendent of Burke-Greis Oil Co., Tulsa, died in a Wewoka hospital September 1. Born in Montpelier, Ind., Sarber came to Tulsa in 1913 and had been associated with the firm of the late Henry N. Greis since that time. He moved to Wewoka in 1929.

L. C. Benne, 49, superintendent of transmission for Cities Service Gas Co. at Wichita, Kans., died following a heart attack recently. Benne had been with Cities Service since 1928.

James Clarence Virdell, 55, head of Virdell Drilling Co., Llano, Tex., died in a Waco hospital September 4 following a heart attack.

Prentiss P. Moore, 60, Midland, Tex., independent oil operator, died September 5 in Amsterdam, N. Y. He suffered a heart attack while taking part in a bench-rest rifle meet.

Richard L. Jones, Sr., 44, vice president in charge of sales for Tennessee Gas Transmission Co., died following a brief illness at his Houston home. Jones was a 1932 chemical engineering graduate of Georgia Tech.

JOSEPH P. SPANG JR.

Portrait by Fabian Bachrach

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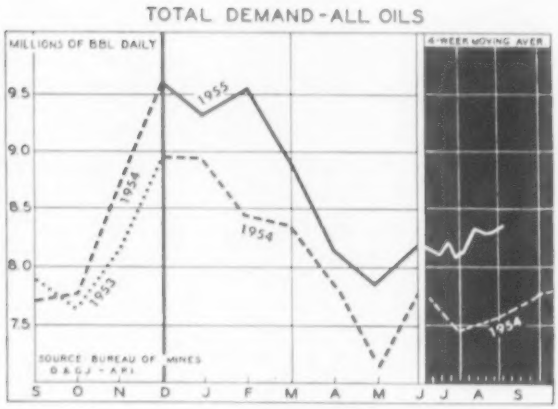
CURRENT STATISTICS——— **John C. Casper, Economics Editor**

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,682,100	DOWN	13,100	UP	561,645
Crude stocks	259,835,000	DOWN	2,634,000	DOWN	16,650,000
Completions	1,126	DOWN	37	UP	47
Refinery runs	7,642,000	UP	60,000	UP	696,000
Gasoline stocks	153,292,000	DOWN	1,406,000	DOWN	202,000
Distillate stocks	133,365,000	UP	3,571,000	UP	15,907,000
Residual stocks	46,587,000	UP	128,000	DOWN	9,607,000
Four-product stocks	368,189,000	UP	3,145,000	UP	5,676,000
Total imports	1,309,200	UP	297,300	UP	244,100



Demand for Crude This Year Exceeded Forecast in Every Month But May

It may be easier to forecast refinery runs for next year than for next month. Refinery operations for next year will be related directly to product demand, but for the short term, crude input may vary widely from the indicated need for products, based on expected demand and current product stocks.

Many suppliers have said that refinery runs were too high during the summer months, but the same thing could be said of most summer operations since the end of the war. Total product demand normally reaches the low point for the year about May and remains at fairly a low level during the summer months. Despite relatively low demands, refinery runs remain high. Runs reached an all-time high of about 7,600,000 bbl. in July this year with only a small reduction in August.

For most of the years since the end of World War II, runs in July averaged more than in January. The only exceptions were in 1949 and 1954, both years of abnormally low demands.

Crude input at refineries is the controlling factor in demand for domestic crude. Erratic refinery operations make it difficult to forecast the need for crude.

Each month the Bureau of Mines estimates market demand for domestic crude for the following month. These forecasts are based on the need for products with consideration given to probable changes in product stocks.

Actual demand for domestic crude since 1951 is listed by months in the first of the following tables. The differences between forecast demands and actual demands are shown in the second table. The bureau also makes a forecast of the demand for crude at the first of each year. In many cases the difference between forecast and actual totals for a month may be more than the difference on an annual basis.

High demand for domestic crude, based on increased refinery runs, has reduced crude stocks to the lowest level in over 3 years. Unless refinery runs are cut in September, crude stocks will drop even lower.

MARKET DEMAND FOR DOMESTIC CRUDE*
(Thousands of barrels daily)

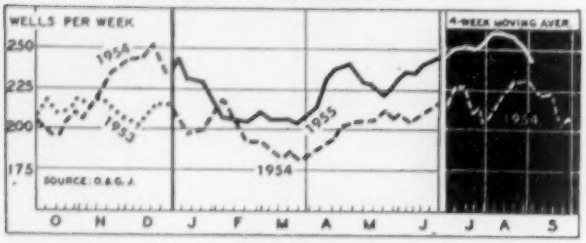
	1951	1952	1953	1954	1955
January	6,041	6,316	6,541	6,431	6,709
February	6,192	6,300	6,491	6,525	6,911
March	6,112	6,270	6,477	6,369	6,678
April	5,869	6,076	6,284	6,327	6,522
May	5,994	4,480	6,465	6,464	6,654
June	6,168	6,331	6,491	6,375	6,803
July	6,055	6,427	6,571	6,236	
August	6,138	6,592	6,563	6,300	
September	6,220	6,464	6,443	6,309	
October	6,132	6,373	6,309	6,303	
November	6,287	6,519	6,445	6,450	
December	6,354	6,519	6,422	6,608	
Year	6,130	6,220	6,459	6,391	

FORECAST DEMAND VS. ACTUAL DEMAND*
(Thousands of barrels daily)

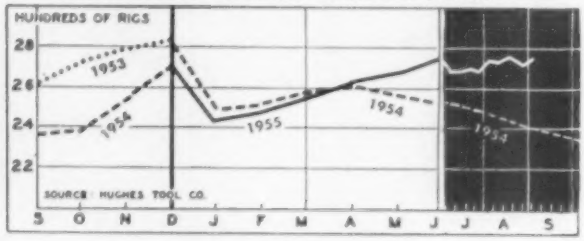
	1951	1952	1953	1954	1955
January	—261	—36	—95	49	—139
February	—412	10	—71	—35	—311
March	—267	70	—97	111	—68
April	31	254	26	93	58
May	—124	1,830	—204	—44	—134
June	—268	29	—241	75	—263
July	—45	—27	—283	274	
August	26	—162	—193	230	
September	—80	—14	27	161	
October	65	77	241	167	
November	—77	—99	105	20	
December	—109	—89	108	—108	
Year	—125	154	—57	83	

*Bureau of Mines.

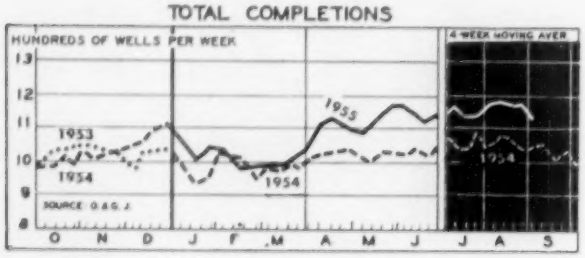
WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



TOTAL COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	9-5-55	Change from 8-29-55	Change from 9-6-54
Gulf Coast	625	30	147
N. and W. Texas-New Mexico	868	9	143
Arkansas-N. Louisiana-E. Texas	164	1	— 9
Oklahoma	331	2	45
Kansas-S. Nebraska	197	2	38
Illinois-Eastern	146	3	—15
Rocky Mountain	301	—1	56
Pacific Coast	134	—1	9
Total United States	2,766	45	414
Western Canada	218	5	100

*Hughes Tool Co.

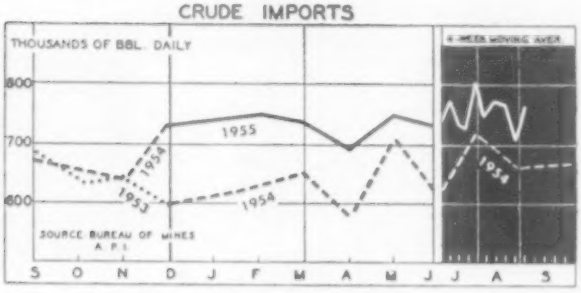
WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 3, 1955

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1955				
	Comp.	Oil	Gas	Dry	Footage	1955	1954	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	0	0	3	13,128	52	76	0	0	0	3	3	0	0	0	50	50
Arkansas	15	2	2	11	66,949	530	399	0	0	0	7	7	25	1	2	117	145
California	38	22	2	14	249,929	1,666	1,610	1	0	0	10	11	31	0	7	285	323
Colorado	37	11	4	22	193,013	983	882	2	0	1	17	20	33	0	20	503	556
Illinois	76	45	0	31	181,453	2,553	1,882	0	0	0	9	9	43	0	3	360	406
Indiana	13	1	0	12	18,744	499	549	0	0	0	5	5	8	0	0	202	210
Kansas	72	36	0	36	256,451	3,399	3,046	0	0	0	12	12	101	1	27	540	669
Kentucky	34	11	5	18	44,766	969	747	0	0	0	8	8	40	0	9	192	241
Louisiana	80	47	8	25	508,671	2,645	2,301	2	0	1	11	14	83	52	21	293	449
North	39	26	4	9	132,737	1,381	1,237	1	0	0	5	6	16	5	2	123	146
South	41	21	4	16	375,934	1,264	1,064	1	0	1	6	8	67	47	19	170	303
Michigan	14	5	0	9	28,405	353	378	0	0	0	4	4	7	0	1	135	143
Mississippi	9	4	0	5	62,555	314	268	0	0	0	1	1	12	0	0	104	116
Montana	4	1	0	3	19,862	227	201	0	0	0	2	2	6	0	1	74	81
Nebraska	21	8	0	13	132,068	534	268	3	0	0	9	12	31	0	0	213	244
New Mexico	34	15	15	4	141,959	1,119	733	1	0	0	2	3	29	2	8	86	125
Northwest	14	0	14	0	58,770	361	249	0	0	0	0	0	2	1	8	26	37
Southeast	20	15	1	4	83,189	758	484	1	0	0	2	3	27	1	0	60	88
North Dakota	5	3	0	2	33,065	160	199	0	0	0	1	1	3	0	0	33	36
Ohio	30	18	6	6	67,367	800	776	0	0	1	0	1	3	0	5	15	23
Oklahoma	192	122	3	67	633,165	5,937	6,119	2	0	0	16	18	99	10	21	455	585
Pennsylvania-New York	18	5	10	*3	47,102	1,088	1,600	0	0	0	0	0	0	0	7	10	17
Texas	389	245	12	132	1,697,884	13,593	12,511	14	0	5	77	96	530	69	94	2,797	3,490
Southwest (1 & 4)	52	19	4	29	233,775	2,075	1,773	3	0	3	18	24	77	24	30	515	646
Gulf Coast (2 & 3)	46	27	3	16	298,908	1,709	1,781	2	0	0	10	12	65	35	29	452	581
East (5 & 6)	26	14	0	12	128,007	663	656	0	0	0	7	7	19	4	8	224	255
North Central (7-B & 9)	147	91	0	56	412,452	5,125	4,723	6	0	0	29	35	265	0	9	1,111	1,385
West (7-C & 8)	95	75	2	18	516,773	3,331	2,909	3	0	2	13	18	101	1	10	472	584
Panhandle (10)	23	19	3	1	107,969	690	669	0	0	0	0	0	3	5	8	23	39
Utah	6	0	0	6	19,192	64	51	0	0	0	6	6	5	0	4	40	49
West Virginia	17	2	12	3	34,610	417	394	0	0	0	2	2	0	0	8	12	20
Wyoming	19	8	0	11	105,319	564	887	0	0	0	7	7	16	0	5	128	149
Miscellaneous	0	0	0	0	0	21	90	0	0	0	0	0	0	0	1	16	17
Total United States	**1,126**	611	79	436	4,555,657	38,487	35,967	25	0	8	209	**242**	1,105	135	244	6,660	8,144
Total previous week	1,163	625	82	456	4,678,405			35	0	1	208	244	1,080	135	236	6,451	7,902
Total September 4, 1954	1,079	579	91	389	4,378,046			31	3	5	176	215	984	96	268	5,997	7,345
Western Canada	60	41	1	18	283,102												

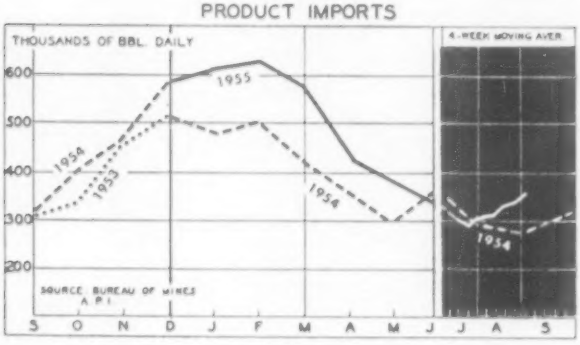
Service wells included: *3.

CURRENT STATISTICS — SUPPLY

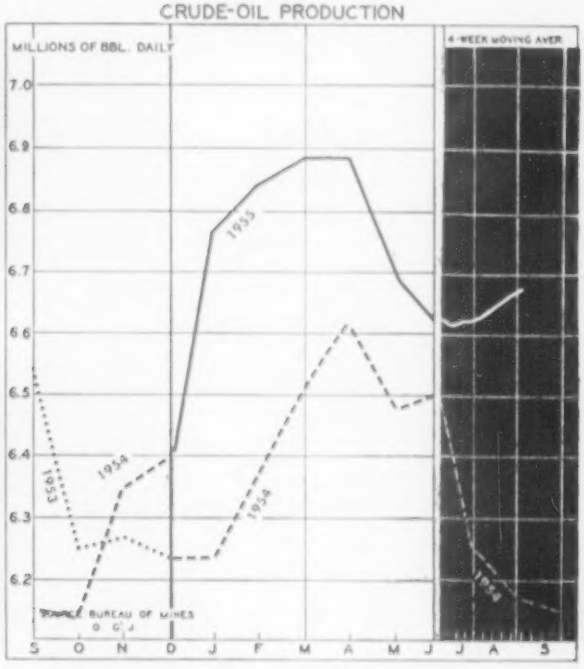
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

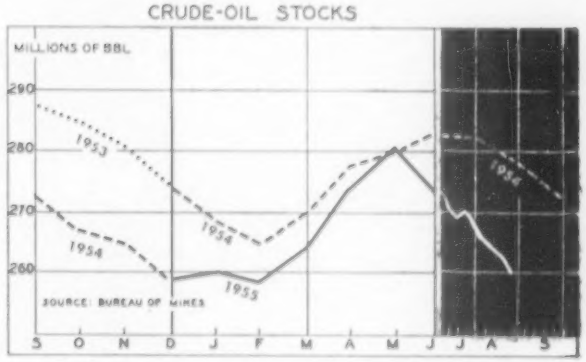


DAILY AVERAGE PRODUCTION FOR WEEK

	September 3			Aug. 27
	Crude oil	Lease condensate	Total	total
Alabama	4,200		4,200	4,000
Arkansas	73,800	500	74,300	73,850
California	978,900		978,900	978,200
Colorado	154,100		154,100	155,000
Eastern	50,800		50,800	50,100
Florida	1,375		1,375	1,275
Illinois	243,200		243,200	237,900
Indiana	31,400		31,400	31,000
Kansas	326,000		326,000	332,900
Kentucky	44,400		44,400	42,700
Louisiana	673,325	57,850	731,175	720,400
North	112,750	2,850	115,600	115,400
South	560,575	55,000	615,575	605,000
Michigan	31,700		31,700	31,300
Mississippi	98,025	4,375	102,400	101,100
Montana	45,100		45,100	45,600
Nebraska	30,200		30,200	29,700
New Mexico	227,350	3,100	230,450	230,700
North Dakota	35,400		35,400	37,600
Oklahoma	541,300		541,300	565,300
Texas	2,692,850	47,500	2,740,350	2,736,375
Dist. 1	49,175	450	49,625	49,425
Dist. 2	135,575	7,550	143,125	142,100
Dist. 3	408,575	22,800	431,375	432,400
Dist. 4	227,575	5,025	232,600	230,800
Dist. 5	48,150	375	48,525	47,875
Dist. 6	116,650	4,625	121,275	120,000
East Texas field	203,750		203,750	202,400
Dist. 7-B	143,850	50	143,900	143,050
Dist. 7-C	168,850	4,100	172,950	174,000
Dist. 8	905,575	2,000	907,575	909,000
Dist. 9	195,275	375	195,650	195,375
Dist. 10	89,850	150	90,000	89,950
Utah	6,300		6,300	6,600
Wyoming	278,900		278,900	283,300
Others	‡150		‡150	300
Total U. S.	6,568,775	113,325	**6,682,100**	6,695,200
Change from previous week, down			**13,100**	
Canada	†380,050		†380,050	380,050
Total U. S. production January 1-September 3			1,658,647,900 bbl.	
Same period last year (crude plus cond.)			*1,571,196,085 bbl.	

*Includes 24,104,950 bbl. condensate. †Week ended previous Monday. ‡S. D. 50, Nev. 100.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

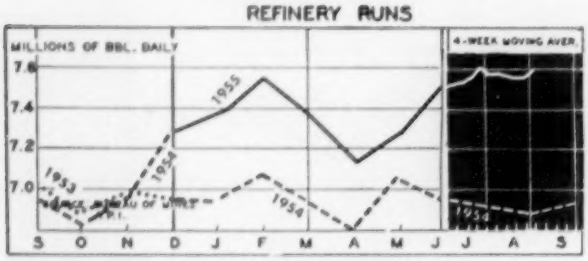
(Thousands of barrels)

	8-27-55	8-20-55	8-28-54
Pennsylvania Grade	3,085	2,946	3,063
Other Appalachian	1,995	1,786	1,719
Illinois, Indiana, Michigan	10,682	11,351	11,873
Nebraska, North Dakota	2,207	2,342	(1)
Kansas	8,312	8,292	10,464
Oklahoma	21,454	21,560	26,732
Arkansas	2,841	2,834	3,192
Louisiana	16,482	16,114	16,987
North	2,794	2,821	2,430
South	13,688	13,293	14,557
Mississippi	2,793	2,843	2,838
New Mexico	7,876	7,543	8,784
Texas	121,293	123,551	130,353
East Texas proper	9,520	9,381	10,988
West Texas	57,405	57,113	57,472
Texas Gulf	23,530	24,534	26,708
Other Texas	30,838	32,523	35,185
Wyoming	14,968	14,763	12,993
Other Rocky Mountain	5,172	5,081	4,788
California	29,890	30,456	33,029
Foreign	†10,785	11,007	9,670
Total	259,835	262,469	276,485

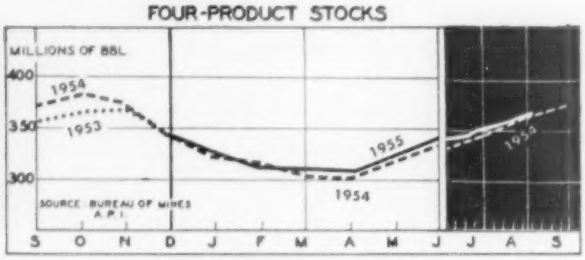
*Bureau of Mines. †Includes 2,266,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

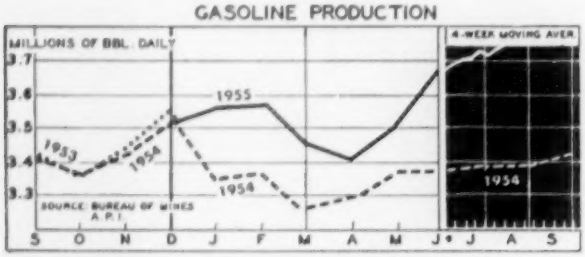
REFINERY RUNS



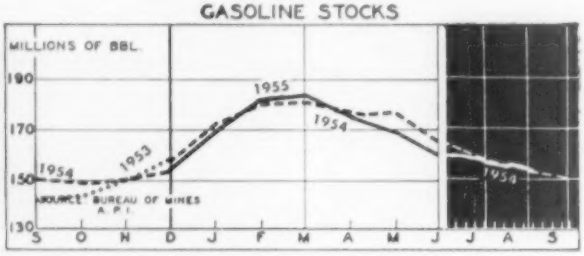
FOUR-PRODUCT STOCKS



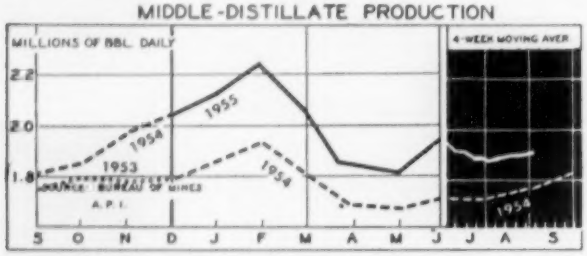
GASOLINE PRODUCTION



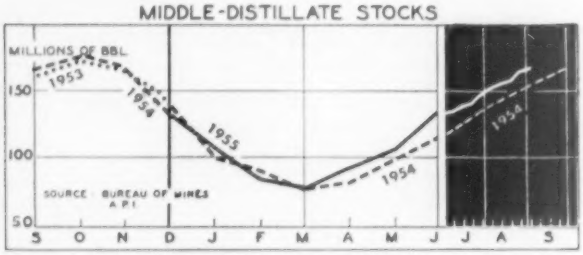
GASOLINE STOCKS



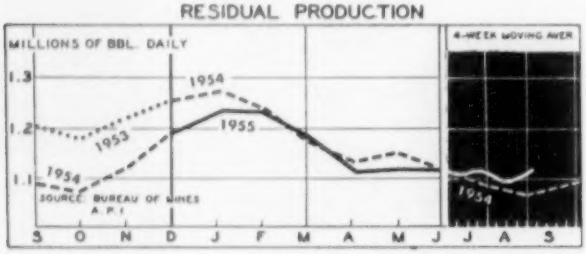
MIDDLE-DISTILLATE PRODUCTION



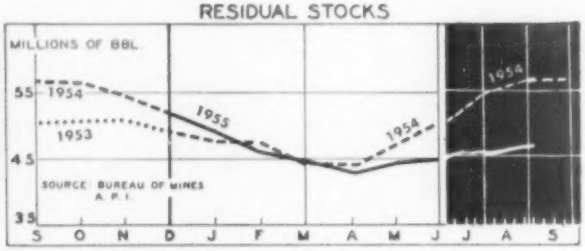
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, SEPTEMBER 2

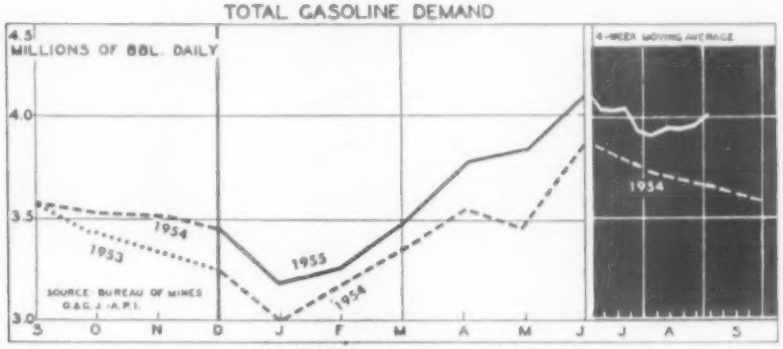
(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,079	457.3	19.3	284.2	178.0	34,499	13,717	47,392	11,921	1,032	447.4	32.9	276.3	191.1
Appalachian:														
District 1	95	41.0	3.6	20.7	6.6	4,151	666	2,872	486	105	48.7	3.9	22.4	6.5
District 2	98	55.0	4.0	14.4	11.1	2,397	602	1,051	451	70	36.2	3.1	10.1	6.5
Ind., Ill., Ky.	1,326	704.9	62.4	271.0	136.2	32,082	9,225	26,249	4,852	1,220	660.4	57.5	247.0	133.1
Okla., Kans., Mo.	691	399.6	19.0	159.3	37.1	14,920	2,387	14,626	1,209	592	334.5	16.2	137.5	43.1
Inland Texas	258	184.4	7.7	52.1	21.4	5,692	434	2,514	1,317	236	174.8	8.7	42.2	23.5
Texas Gulf Coast	1,909	875.1	107.6	427.0	244.7	21,135	3,630	15,036	7,400	1,728	810.6	113.5	411.4	236.0
La. Gulf Coast	673	344.6	43.7	179.7	46.1	9,294	2,503	5,695	1,529	568	306.3	49.9	153.9	43.0
N. La. and Ark.	99	38.4	9.0	21.7	5.3	3,776	979	2,125	69	87	34.7	6.4	20.8	6.1
Rocky Mountain:														
New Mexico	22	12.4		3.0	2.9	229	10	84	40	20	11.7	0.6	3.4	3.2
Other Rocky Mtn.	276	135.4	2.7	63.3	41.6	5,559	478	2,910	933	250	114.7	4.1	57.4	35.9
California	1,116	492.3	3.7	156.0	337.9	19,558	314	12,811	16,380	1,031	440.4	3.8	131.4	357.7
Sept. 2, 1955	7,642	3,740.4	282.7	1,652.4	1,068.9	153,292	34,945	133,365	46,587	6,939	3,420.4	300.6	1,513.8	1,085.7
Aug. 26, 1955	7,582	3,801.6	292.0	1,615.3	1,146.7	154,698	34,093	129,794	46,459					
Sept. 3, 1954	6,946	3,407.1	372.1	1,430.1	1,081.0	153,497	35,364	117,458	56,194					

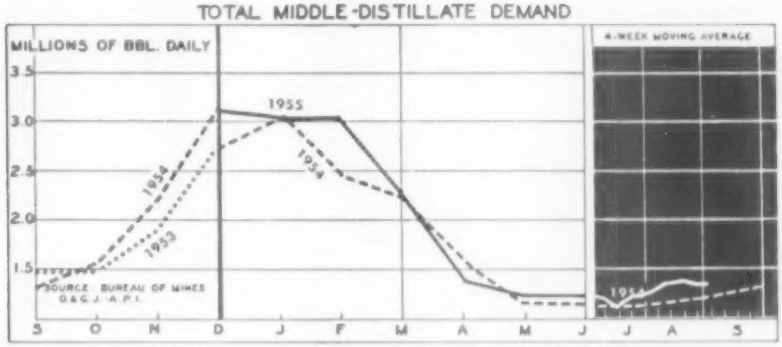
*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CURRENT STATISTICS — DEMAND

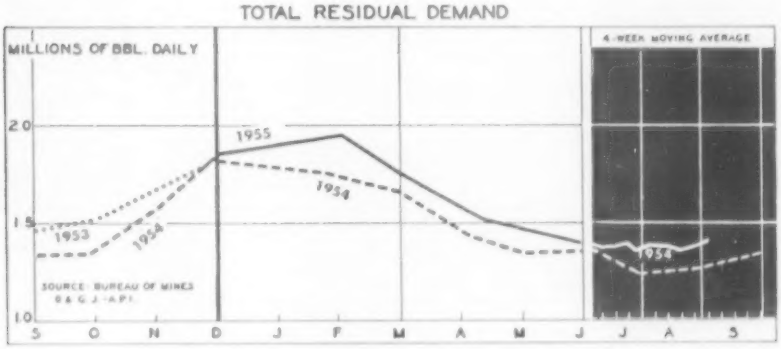
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of September 7, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11-11.25	11.5-12	10.5-10.75
Premium gasoline	12.25-12.5	13-13.75	12-12.25
42-44 w.w. kerosine	9.25-9.50	10.3	8.75-9.00
No. 2 straw fuel oil	8.25-8.50	9.55	8.5-8.75
No. 6 residual	$1.75-1.85	$2.65-2.85	$2.10-2.25

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Natural gasoline prices moved up 0.5 cent a gallon, effective September 2. The new Group 3 price for Grade 26-70 is 5.5 cents a gallon. Comparable prices in past years were: 5.0 cents for 9-1-54, 6.375 cents for 8-24-53, 6.875 cents for 9-3-52, 6.375 cents for 9-17-51, 6.25 cents for 9-18-50.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 9-2-55	3,788	4,009
June 1955	3,643	4,112
August 1954	3,391	3,649
September 1954	3,420	3,586
Middle distillate:		
Four weeks ended 9-2-55	1,909	1,341
June 1955	1,898	1,235
August 1954	1,755	1,197
September 1954	1,815	1,370
Residual fuel:		
Four weeks ended 9-2-55	1,118	1,401
June 1955	1,080	1,457
August 1954	1,069	1,258
September 1954	1,086	1,319

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, July 11, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

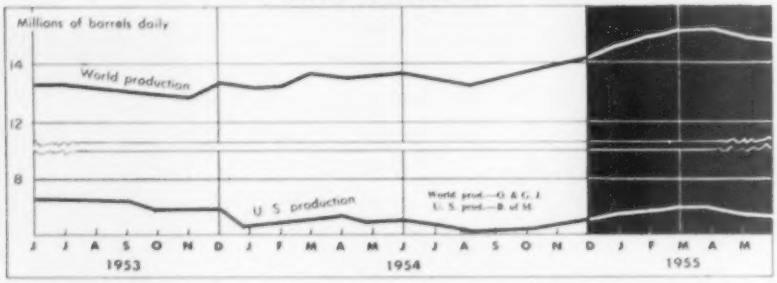
Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.60
Middle District	3.47
Southwest Pennsylvania	3.18
West Virginia	3.07
Buckeye Grade	3.01
Zanesville Grade	2.82
Illinois Basin	2.90

CRUDE PRODUCTION

(Thousands of barrels daily)

Month—	U. S.	World
June 1955	6,613	14,778
May 1955	6,677	14,850
April 1955	6,887	15,148
October 1954	6,135	13,687
June 1954	6,500	13,669

CRUDE OIL PRODUCTION

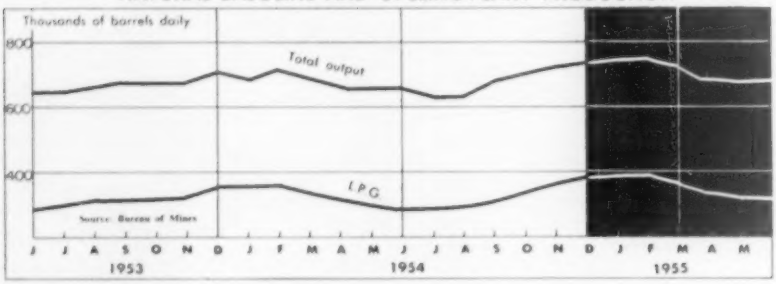

Millions of barrels daily
14
12
8
World production
U. S. production
World prod.—O. & G. J.
U. S. prod.—B. of M.
J J A S O N D J F M A M J J A S O N D J F M A M
1953
1954
1955

PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

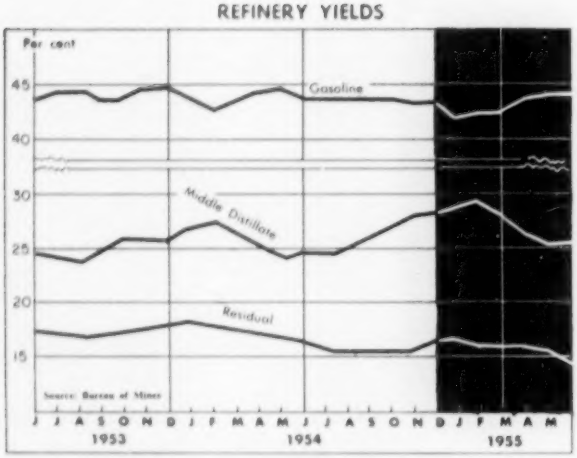
(Thousands of barrels daily)

Month—	L.P.G.	Total
June 1955	313	672
May 1955	317	670
April 1955	334	686
October 1954	332	692
June 1954	299	660

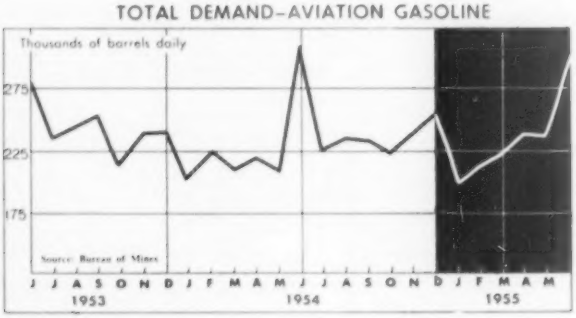
NATURAL GASOLINE AND CYCLING-PLANT PRODUCTION



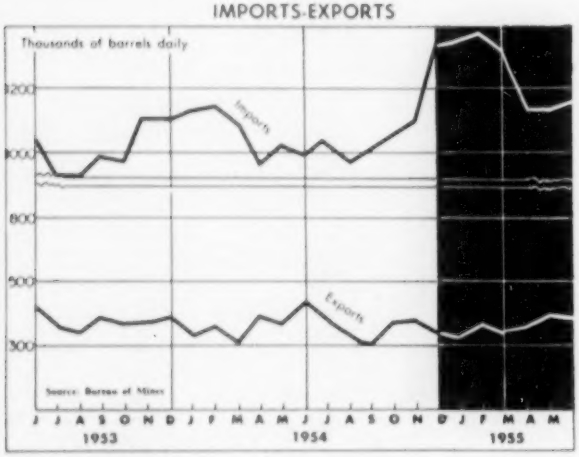
REFINERY YIELDS



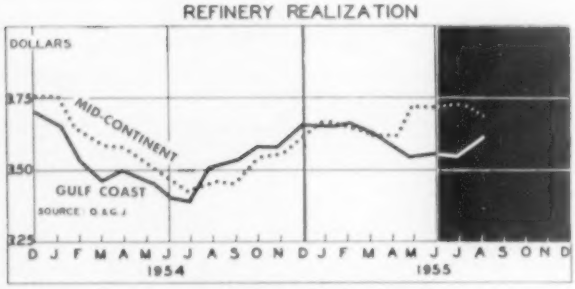
TOTAL DEMAND—AVIATION GASOLINE



IMPORTS-EXPORTS



REFINERY REALIZATION



REFINERY REALIZATION

	Aug.* 1955	July* 1955	June 1955	Aug. 1954
Mid-Continent	$3.69	$3.73	$3.76	$3.46
Gulf Coast	3.62	3.53	3.48	3.52

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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#12-PE 94' EMSCO Galvanized Bolted Type 437,000# capacity portable drilling mast with 7' high x 38' long pin type substructure, 3 years old, A-1 condition, $8,800. Contact E. L. Lambert, Iverson Supply Company—Phone Davis 5-2836, Farmington, New Mexico.

FAILING 1500 heavy duty rig, 38' mast, 4½"x6" pump, automatic chuck and breakout table, mounted on L-180 International truck, 590' of 2⅞" drill pipe, 800 gal. water tank, 1953 Chev. ½ ton pickup. $13,500.00. K & E Drilling, Inc., 1006 Central Bldg., Wichita, Kans.

FOR SALE—Complete Rotary rig, U-10 Drawworks, 7¼ x 14 PHD Pump, both powered by Twin 6 GM 6-71 Motors. 127' Lee C. Moore Mast, 5' base overall, steel flooring, Ideal Type L Swivel, Baash-Ross block, BJ Hook, 4500' 4½" bottleneck drill pipe. Complete with dog house, fuel tank, water tank, light plant, water pump, and all hand tools, now drilling. Box J-118, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.

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$50,000 New Spare Parts for Above.

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Other Equipment, Instruments, Pumps, Pipe, Valves and Fittings necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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FOR SALE—Our gasolene plant north of Arkansas City, Kansas. Complete details and price furnished upon request. Contact Patridge, Cities Service Oil, Bartlesville, Oklahoma.

FOR SALE—At our Oklahoma City warehouse one used 2½"x5"x10" Fig. 1450 Wheatley power pump, Ser. WBM 2060, mounted on steel base and DC to Buda BTH motor, Ser. No. 226569A. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FOR SALE—At our Oklahoma City warehouse one used 2½"x5"x-10" Gaso power pump, Fig. 710-S, serial No. 7435 on steel base and V-belted to HXE Hercules motor, serial No. 3330493. Price $1500.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

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TYPE 75 powered by two Model 6-LRO Waukesha Engines, with two Type C-250 Ideal Slush Pumps, Type R-3 Ideal Swivel, Type D-20 Ideal Traveling Block, 4200 BJ Hook, Type MS-20½ Ideal Rotary, Steel Mud Pits, Shaffer Blowout Equipment, 10,000'—3½" Grade E Drill Pipe, twenty Drill Collars and 129' Lee C. Moore Mast.

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SMALL SUPEREX gasoline plant, 3 million cu. ft. maximum gas capacity and/or 4,500 gallons gasoline and 4,500 gallons butane-propane daily. Russell Enginering Corporation, P. O. Box 6731, Houston 5, Texas.

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ROTARY RIG—Late Model Wilson Giant Single Engine Draw-works with Twin 6 GM Diesel Engines. Lee C. Moore 131' Mast with 6' Substructure. 7½" x 14" Wheland Pump with Twin 6 GM Diesel Engine. Rig is in excellent condition and complete, less Drill Pipe. Price $70,000.00. Would trade for Production or Land. 700 City National Bldg., Wichita Falls, Texas.

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U-10 UNIT RIG, power—2—D13000 Caterpillars compounded, C150 Mud Pump, 96' L. C. Moore Cantilever Type Mast with base, 5'x14'x40' substructure, 4'x7'6"x44'—3 compartment mud tank, Link Belt Shale Shaker, 12½" KW Generator Skidded with XAH Waukesha, 5 KW Kohler spare plant, 4"x40' and 3"x40' Kellys, FE 17½" Ideal Table, Series 900 Shaffer Double Gate, 7'6"x7'x16' Doghouse and Stand. Complete Vapor Proof Lighting System. Complete casing tools, all necessary hand tools, 20' Trailer house. Rig located South Central Wyoming. Inventory sent on request to interested parties. Box J-101, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box J-130, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

CHEMIST with technical background and thoroughly familiar with latest methods of analysis of light hydrocarbons. Send complete record of education, experience and minimum salary expected. Box J-119, The Oil and Gas Journal, Tulsa, Oklahoma.

STRUCTURAL GEOLOGIST with PhD and preferably minimum one year's experience. Under 35 with military requirements fulfilled. Opportunity for fundamental research in Houston research laboratory of major oil company. Write Box H-997, The Oil and Gas Journal, Tulsa, Oklahoma.

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Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

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EXPERIENCED SEISMOGRAPH Party Chiefs, Seismologists, Chief Computers, Computers, and Surveyors by established and expanding Contract Seismograph Company, Dallas organization. Salary commensurate with experience. State qualifications, references, and salary expected in first reply. Must be free to move with field party. Box J-102, The Oil and Gas Journal, Tulsa, Oklahoma.

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to provide technical supervision for large developed water-flood project in southeastern Kansas. Performance of duties requires graduate engineer with field experience in flooding operations. Properties owned by well-established independent producing company; excellent future possibilities for properly qualified individual.
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THE OIL AND GAS JOURNAL, TULSA, OKLAHOMA.

SITUATIONS WANTED

LANDMAN—TITLE—ADMINISTRATIVE. 3½ years Field and Office. 30. Attorney. Box J-109, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINEER with seven years experience in all phases of subsurface geology, desires responsible position with independent operator or small to medium sized company. Box J-108, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER, single, 7 years major company experience, including well work and subsurface geology in Gulf Coast and Canada, desires job with future. Box J-120, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, Ph.D., 18 years widely varied experience of foreign operations, exploration and development, seeks responsible executive position. Box J-126, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED in contracts, titles, and leasing with major oil company. College Graduate. Presently employed. Desires field land work with progressive company. Box J-128, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERVISOR: extensive experience both domestic and foreign. Speak fluent Arabic and some Spanish. Will consider any country. A. J. Gillham, 639 N. Union Place, Tulsa, Oklahoma. Ph. LUther 4-5956.

DISTRICT RESERVOIR ENGINEER desires position with consulting firm or independent operator. Six years experience with major oil company, primarily water flooding. Box J-105, The Oil and Gas Journal, Tulsa, Oklahoma.

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GRADUATE PETROLEUM ENGINEER. Five years experience Rocky Mt., Mid-Continent and Illinois Basin. Excellent background in completions, workovers and secondary recovery. Desire connection with active independent. Box J-127, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE RESPONSIBLE POSITION exploration, Land, sales, etc. Some capitol available. Mechanical Engineering degree. 9 years geophysical interpretation, personnel management. Prefer Rocky Mountains. Box J-123, The Oil and Gas Journal, Tulsa, Oklahoma.

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Age 50, good health, married, 3 children, fluent Spanish. 27 years operational and exploration experience. Familiar with all phases of mechanization as applied to underground mining. Have good record of low costs. Desires position of responsibility.

Box J-125, The Oil and Gas Journal, Tulsa, Oklahoma.

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MIDLAND, TEXAS—Now Available: 945 sq. ft. partitioned for four attractive offices located in Tex-Harvey Building. Private rest rooms. Write Tex-Harvey Oil Company, Tex-Harvey Building, Midland, Texas. Phone 3-3366.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 3,075.83 acres of land in ten parcels within the known geologic structure of San Juan Field in San Juan County, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P. M., MST, September 28, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. J. A. DeLany, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Sacramento, California. Notice is hereby given that the SW¼SW¼ Sec. 28, T. 27 S., R. 27 E., M.D.M., California, containing 40 acres, within the known geologic structure of the East Premier Field, California, will be offered as a single parcel for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 10:30 A. M., October 12, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids may be obtained from the Bureau's Sacramento, California office. Manager, Land Office, Sacramento, California.

LEGAL

SEALED BIDS FOR OIL AND GAS leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 O'Clock (M.S.T.), WEDNESDAY, SEPTEMBER 21st, 1955 at which time they will be opened and publicly read. Nine (9) Units involving 7,683.78 acres of trust Indian lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and a list of lands advertised call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

Equipment Men

Lane-Wells Announces Changes in Louisiana

Increased activity in Louisiana is reflected in the following appointments by Lane-Wells Co. in that area, according to J. M. Henderson, Gulf Coast division manager.

E. H. Barker, gun-perforator operator in New Iberia, has been appointed district sales engineer at Lake Charles. E. V. Cleveland, gun-perforator operator at Vivian, La., has been appointed district sales engineer at Shreveport. H. R. Cassity, gun-perforator operator at Longview, Tex., has been transferred to Vivian as operator-in-charge. W. H. Redford, district sales engineer at Shreveport, has been transferred to Midland, Tex., as division sales engineer.

Oil Base Announces No-Glo Distributors

George Miller, president of Oil Base, Inc., announces the following distributors for No-Glo Oil, the patented non-fluorescing oil that is used for converting a clay-water mud to an emulsion mud.

National Mud Services, Inc., Oklahoma City, will sell and service No-Glo products in Oklahoma, Kansas, and the Texas Panhandle.

Tom M. Richardson, Houston, will supply No-Glo products within a 100-mile radius of Houston.

Welex Announces Several District Appoints

Jack E. Brown has been named the assistant manager of the new Welex Jet Services, Inc., district office at Farmington, N. M.; Claude (Doc) Alexander has been appointed sales engineer for the district office in Winfield, Kans.; James E. Brown has been promoted to the position of sales engineer for the Bartlesville, Okla., district office; and Albert E. Stringer has been appointed sales engineer for the Ardmore, Okla., district office, it has been announced by the oil-well service company.

Brown has been with Welex for over 3 years.

Alexander, a veteran of 10 years of oil-field work, has been with Welex for 2 years.

Brown has been engaged in oil-well service work for 7 years; over 6 of these years have been with Welex.

Stringer has been with Welex in various positions for 7 years.

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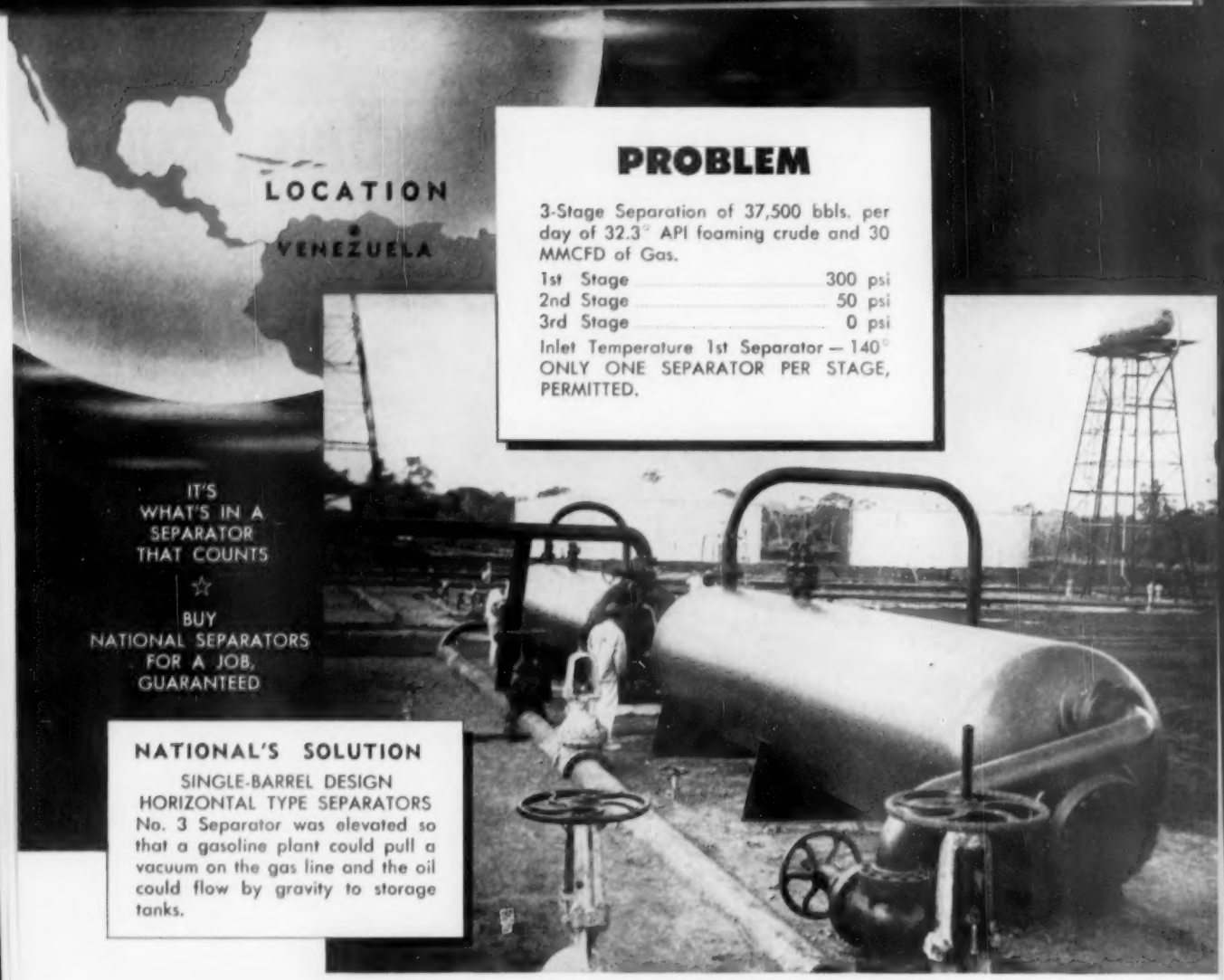

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3-Stage Separation of 37,500 bbls. per day of 32.3° API foaming crude and 30 MMCFD of Gas.

1st Stage	300 psi
2nd Stage	50 psi
3rd Stage	0 psi

Inlet Temperature 1st Separator — 140°
ONLY ONE SEPARATOR PER STAGE, PERMITTED.

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WHAT'S IN A
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THAT COUNTS

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FOR A JOB,
GUARANTEED

NATIONAL'S SOLUTION

SINGLE-BARREL DESIGN
HORIZONTAL TYPE SEPARATORS
No. 3 Separator was elevated so that a gasoline plant could pull a vacuum on the gas line and the oil could flow by gravity to storage tanks.

NATIONAL FURNISHED SEPARATORS WITH THE FOLLOWING SIZES AND OPERATIONAL CAPACITIES

	Press. on Separator psi	Bbls. oil per day	Std. Cu. Ft. Gas Per day
No. 1 Separator — 5′ x 22′-6″ long	300		22,700,000
No. 2 Separator — 5′ x 22′-6″ long	50		7,200,000
No. 3 Separator — 6′ x 20′ long	0	37,500	194,000
TOTALS		37,500	30,094,000

Had only one stage of separation been utilized at 300 psi, over 7,000,000 cu. ft. per day would have been liberated in the stock tanks.

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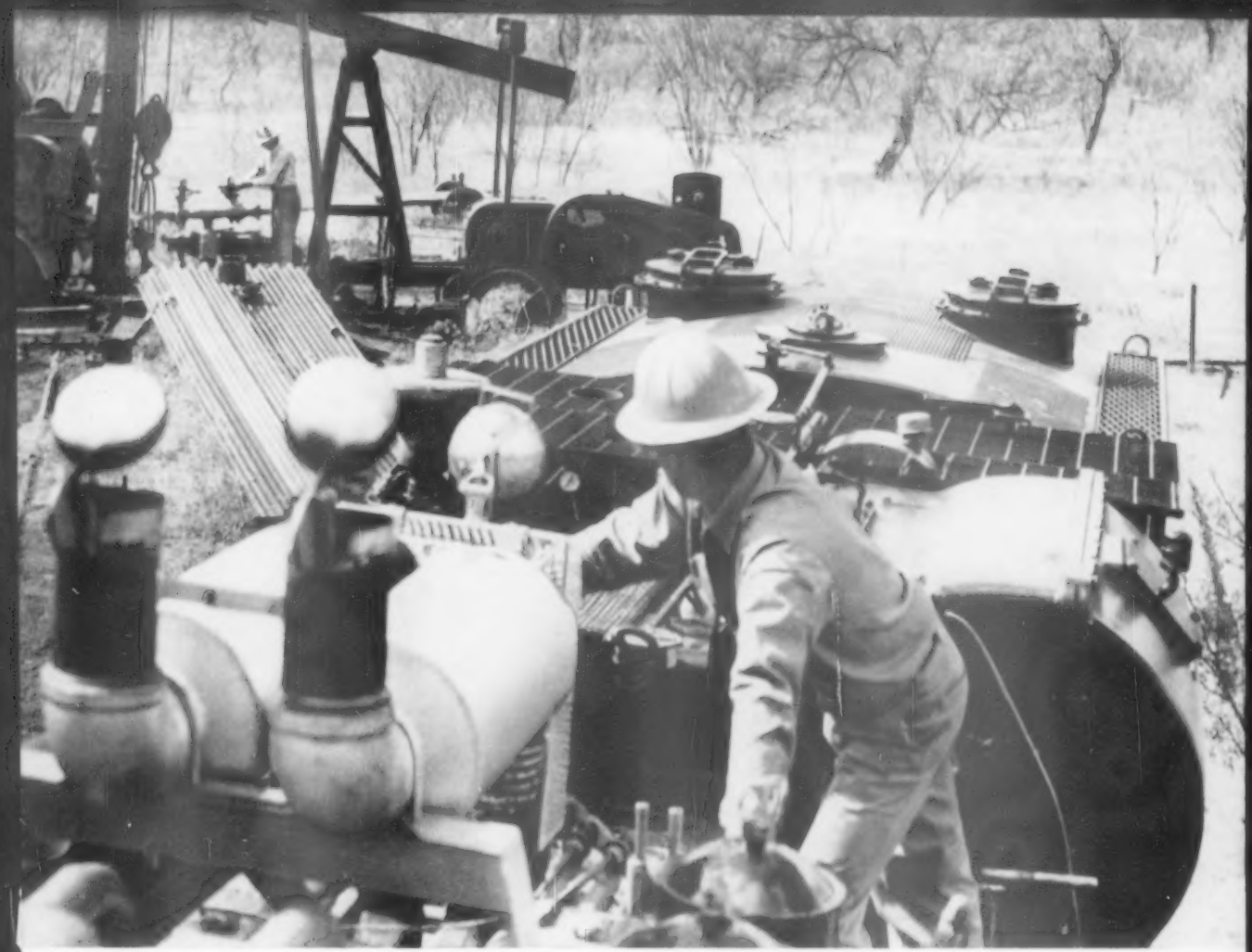
TULSA, OKLAHOMA



PETROJEL

Economical new DOWELL treatment uses thickened lease crude oil for low-fluid-loss fracturing medium

By thickening lease crude oil, diesel fuel or kerosene to make them suspend sand . . . Dowell's new, exclusive Petrojel* treatment offers you an economical fracturing service to increase oil production.

Dowell engineers can mix Petrojel materials to almost any desired thickness. They add chemical agents to almost any crude base, either in truck-mounted mixing tanks or in the operator's own lease tanks.

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For service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma. Department I-11.

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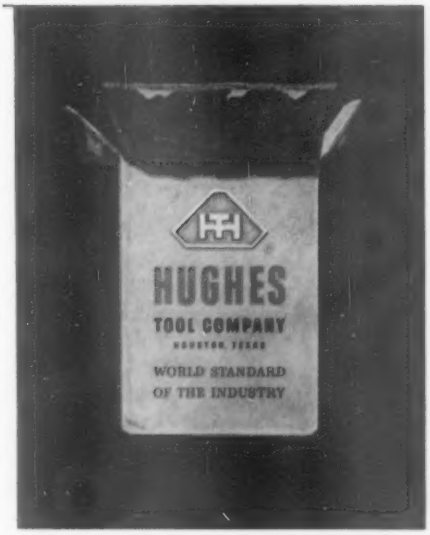
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